



**WÄRTSILÄ**

**Environmental Report 2000**

Power for Land and Sea



Carnival Spirit is the first ship fitted with Wärtsilä's EnviroEngines. In this photo the cruise ship is on its sea trials at the beginning of the year 2001.





## Contents

CEO's Statement	2
Wärtsilä's Sustainability Review	3
Profile of the Reporting Organization	4
Scope of the Report	5
Coverage of the Report	5
Data Collection	5
Key Figures	6
Economic	6
Environmental	7
Social	7
Wärtsilä's Strategy	8
Wärtsilä Values	9
Board of Management	9
Environmental Report Project Team	9
Policies, Organization and Management Systems	10
Wärtsilä Operative Excellence System – OpExS	10
Stakeholder Relationship	12
Product Environmental Performance	16
Energy	16
Emission to the Air	19
Emission Reduction Technologies	21
Compliance	23
Installations of Emission Reduction Technologies	24
Water Consumption	24
Service	24
Operational Performance	28
Environmental Performance	28
Economic Performance	31
Social Performance	32
Operational Performance Data	34
Verification Statement	35
Glossary	36
Addresses	38
Contact Us	41

# CEO's Statement



## Dear Reader,

The year 2000 was in many respects a successful and eventful one for the Wärtsilä Group. The overall group strategy and structure were refined to focus on the engineering activities within our Power Divisions and Imatra Steel. The group's name was changed from Metra to Wärtsilä to emphasize this focus.

Within our core activity, the Power Divisions, we reached our key goal to improve profitability and the divisions now posted a clear profit for the first time since 1996. Also Imatra Steel improved profitability.

The basis for our strategy and structure is our mission to meet the global needs of sea transportation and power generation by developing equipment and services that convert fossil fuels into power efficiently and with the lowest possible environmental impact.

We have positioned ourselves as the leading global ship power supplier and a major provider of solutions for decentralized power generation and of supporting services.

Our mission and vision mean that:

- We take responsibility for the total functionality of our system supplies.
- We maintain and develop a comprehensive service network capable of enhancing the value of our customers' equipment.
- Our operations are based on a network of long-term, high-value subcontractor relationships.
- We develop products that meet the strictest environmental criteria.
- We create value for our shareholders.

As a part of the major restructuring for improvement of profitability and overall quality of operations that has taken place within the Wärtsilä Power Divisions (previously Wärtsilä NSD) since late 1998 we adopted policies regarding quality in September 1998, an Environmental Policy and Guidelines in May 1999 and a Policy for Occupational Health and Safety in January 2001. The aim of these policies is to safeguard the sustainable development of our group, its products and services and to guarantee a safe working environment for our employees. Imatra Steel has likewise adopted an Environmental Policy, which was published in the first Environmental Report of the Imatra Steel Works in 1999.

As a leading supplier of large internal combustion engines Wärtsilä Corporation has a significant responsibility to develop products and technologies that impose the

smallest possible environmental burden over their lifetime. In this respect our work concentrates on the shaft efficiency of the engines to limit carbon dioxide (CO<sub>2</sub>) emissions and on the level of nitrogen oxides (NO<sub>x</sub>) in the emissions. We have further broadened our development work to cover the amount of visible smoke in the emissions without compromising on the strictest CO<sub>2</sub> and NO<sub>x</sub> limitations. To the extent that we detect possibilities to further reduce the amount of harmful emissions by using secondary methods of cleaning the exhaust we work with long-term partners to optimize the total plant design.

In early 2000 Wärtsilä and Carnival Corporation started a joint project called EnviroEngine to develop the "Smokeless diesel engine". In May 2001 both companies received an award for the best environmental contribution within the cruise and ferry industry. The award was granted by Lloyd's List during the Cruise and Ferry Conference 2001 in London. The award is in recognition of the diesel engine that successfully applies common rail and water injection technology for the good of the environment.

Wärtsilä Corporation is committed to gaining certification for all its main activities certified in accordance with the ISO 14001 standard. This work is proceeding according to plan. Within the Power Divisions several smaller units are already certified and the major ones are in the process of being certified. Within Imatra Steel, the Imatra Steel Works and Billnäs Spring Works are certified and the Kilsta Forge is aiming to achieve certification within the current year.

The key words within our mission statement - to develop products and services with the lowest possible environmental impact - is our commitment to sustainable development. The purpose of this report is to chart our performance towards that mission and the goals set in our Environmental Policy and Guidelines.

A handwritten signature in black ink, appearing to read 'Ole Johansson'. The signature is fluid and cursive, with a long horizontal stroke at the end.

Ole Johansson  
President & CEO



Matti Kleimola, CTO, Professor

Many companies including Wärtsilä have paid a lot of attention to developing their products and activities in accordance with sustainability development principles. Wärtsilä has decided to publish this first Environmental Report in order to describe the results of its progress in sustainability issues. Our research and development aims at developing engines with the lowest possible environmental impact. This work is described in this report. Another reporting area is the operations of the Wärtsilä product companies.

After evaluating various reporting guidelines, we decided to adopt the new Global Reporting Initiative (GRI) when we started to prepare the report. GRI offers a common framework based around three elements of sustainability: economics, environment and social issues. All three elements are important in order to give our stakeholders a full picture of the company and its performance. This first report is a starting point focusing mainly on environmental issues, of which we have the best documented data available at the moment. The report also gives an overview of the financials, described in detail in our Annual Report. At the moment we are working on developing a system to gather information globally on sustainability issues and for this reason social issues are described only as examples from various units.

Sustainability reporting is very challenging. This report does not cover the operations of all the Wärtsilä units. Our aim in the future is to make a well-balanced report covering all the three elements of sustainability and all units. To cover all the issues stated in the GRI guidelines requires an internal reporting system for gathering information on a regular basis globally. We are developing such a system at the moment and we have now reached the first stage of this development project.

To set corporate-level sustainability targets would require knowing the whole picture in all units. Our corporate targets will be set as soon as the coverage of our units is complete.

Wärtsilä's main stakeholders are customers, investors, personnel, suppliers and society in general. This report is mainly meant for our customers and investors.

## FROM VALUES TO PRODUCTS AND OPERATIONS

Our values, mission and vision create the basis for our sustainability. As the leading global ship power supplier and a major provider of solutions for decentralized power generation Wärtsilä places high priority on achieving sustainable development in its products and operations. R&D at Wärtsilä focuses on environmental issues. Wärtsilä has set global policies on environmental, quality and occupational health and safety issues to ensure globally consistent operating policies everywhere in the world. Management systems and tools have been created to implement the policies and to improve the processes and

quality of our work for the benefit of our customers and shareholders.

Wärtsilä has significantly increased the efficiency of its engines during recent decades. Nowadays Wärtsilä can provide engines with a shaft efficiency up to 50%. This development has a major impact on the environment. High efficiency means lower fuel consumption and lower emissions, especially CO<sub>2</sub> emissions. Shipping has been shown to play a significant role in the development of environmentally sustainable transport, even if it represents less than 2% of total CO<sub>2</sub> emissions in the world.

Nitrogen oxides have been one of the main concerns in land-based and marine power plants based on diesel and gas engines in recent years. Wärtsilä has invested a considerable effort into reducing the NO<sub>x</sub> emissions of both engine types. All Wärtsilä products comply with the requirements of International Maritime Organization and Wärtsilä provides power plant concepts which fulfil the requirements of World Bank guidelines. The impact of ship NO<sub>x</sub> emissions on local and regional air quality will continue to be the dominant policy driver and may motivate additional domestic and international policy action.

One of the highlights of the year 2000 was cooperation with one of our main customers to develop a "smokeless engine" for marine applications. Called the EnviroEngine concept, this provides environmentally sound technologies specifically designed to decrease emissions and smoke at any loads. The first EnviroEngine was delivered to the customer in the spring of 2001.

Wärtsilä develops and provides both primary and secondary methods for emission reduction. These technologies ensure that our products fulfil all the relevant legislation.

The environmental impact of natural gas concerning CO<sub>2</sub> is 25% less than that of liquid fuels. Current development is focusing on gas engines and Wärtsilä offers a full range of such engines for various applications. The gas power plant sector offers the company considerable growth potential.

The achievements of research and development in respect of higher efficiency and emission reductions also have a significant impact on our operational performance. At the same time our factories have been able to shorten engine test run times, which has reduced factory fuel consumption and site emissions.

Wärtsilä product companies and network companies with workshops are implementing environmental management systems based on ISO 14001. The first companies have already gained this certificate. The implementation of EMS continues in the rest of the companies.

We hope that this first environmental report gives useful information about our products and our operations to our stakeholders.

# Profile of Reporting Organization

	Description	Strategy
<p><b>Wärtsilä Corporation</b></p> 	<ul style="list-style-type: none"> <li>▶ Wärtsilä Corporation is the leading global ship power supplier and a major provider of solutions for decentralized power generation and of supporting services. In addition Wärtsilä operates a Nordic engineering steel company and manages substantial share holdings to support the development of its core business.</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Power for land and sea</b></li> </ul>
<p><b>Marine &amp; Licensing</b></p> 	<ul style="list-style-type: none"> <li>▶ Wärtsilä supplies engine room solutions, integrated propulsion systems, main and auxiliary engines and maintenance services for all types of marine vessels and offshore applications.</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>The Ship Power Supplier</b> The world's leading supplier of marine propulsion systems and emissions control technology</li> </ul>
<p><b>Power Plants</b></p> 	<ul style="list-style-type: none"> <li>▶ Wärtsilä delivers gas and oil fired power plant solutions from 1 MW to 300 MW. These power plants are used for baseload, load management, cogeneration and gas compression applications. Deliveries include turnkey construction and long-term maintenance and operation.</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Power for a changing world</b> Power solutions for decentralized power generation fast, flexibly and with respect for the environment</li> </ul>
<p><b>Service</b></p> 	<ul style="list-style-type: none"> <li>▶ Wärtsilä's service business builds on the Group's global base of installed engines and power plants. With this activity the Group supports its customers throughout the lifecycle of these products. Wärtsilä is close to its customers, through subsidiaries in some 50 countries.</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Simply better performance</b> Ensuring lifetime efficiency of customers' systems</li> </ul>
<p><b>Imatra Steel</b></p> 	<ul style="list-style-type: none"> <li>▶ Imatra Steel is Wärtsilä's special engineering steels company. Imatra Steel produces round, square and flat special bars, forged engine and front axle components, leaf springs and tubular stabilizer bars. The company's customers are European automotive and mechanical engineering companies.</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Special engineering steels for automotive and mechanical engineering companies</b></li> </ul>

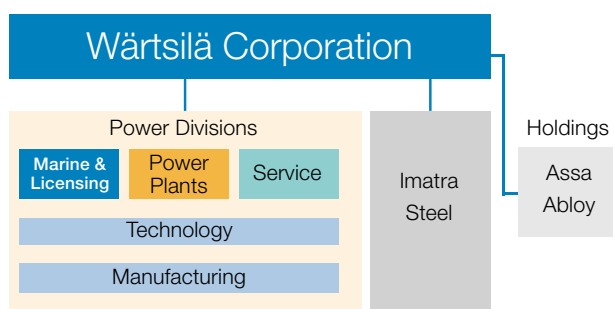
## SCOPE OF THE REPORT

The first Environmental Report of Wärtsilä Corporation has been prepared according to the GRI (Global Reporting Initiative) guidelines consisting of economic, environmental and social issues. Wärtsilä has chosen to adapt an incremental approach to developing its sustainability reporting towards full adoption of the GRI guidelines. In this report Wärtsilä focuses more on environmental performance than social and economic issues, and it has not applied all the indicators stated in the GRI guidelines. The product performance is reported from the environmental point of view. The selected product and operational performance indicators reflect material impacts at the corporate level. A fullscale GRI implementation including all necessary indicators will be evaluated after the final version of the GRI guidelines is published.

## COVERAGE OF THE REPORT

This report principally covers Wärtsilä's Power Divisions. Imatra Steel and Wärtsilä holdings are not covered in the report, unless separately stated. Imatra Steel Works of Imatra Steel (part of Wärtsilä) has an published environmental report of its own in 1999. Imatra Steel environmental reporting will be integrated into Wärtsilä reporting in 2002. The operational performance of Imatra Steel has a significant impact on energy consumption and air emissions. The Wärtsilä Power Divisions (Wärtsilä) comprise the following five businesses: Marine & Licensing, Power Plants, Service, Technology and Manufacturing. The first three of these generate external net sales and the last two are internal group functions.

However, the data on operational performance covers only the product companies. The operational data covers 64% of group personnel and 100% of engine and gearbox manufacturing. The rest of the companies are network companies, which mainly are sales and service units. Some of the network companies have their own workshops, but the environmental aspects are mainly related to the use of electricity which we evaluate to be quite low compared to the reported companies.



The reported indicators do not cover the performance of the supply chain. Wärtsilä's target is to gather the relevant data from all the units for the Environmental Report 2004, to be published in 2005. Wärtsilä will publish the Environmental Report every second year.

The data of the Wärtsilä companies will be included in forthcoming reports as shown in the following table:

Units	Year of publication	2001	2003	2005
Power Divisions	Product companies	•	•	•
	Network companies: Assembly and packing		•	•
	Network companies: Sales and service			•
Other	Imatra Steel		•	•

## DATA COLLECTION

Sustainability performance is divided into product performance and operational performance. The data for product performance is based on measured test results. Performance data on economic, environmental and social aspects of sustainability presented in this report has been collected from the product companies using a detailed data questionnaire.

The assigned personnel at the product companies are responsible for the data and its accuracy. The product companies report their data on sustainability issues to the Group's HSE-manager, who is responsible for consolidating the data.

The content of this report has been reviewed and approved by the Wärtsilä Board of Management on May 17<sup>th</sup> 2001.

The completeness, accuracy and consistency of the sustainability data has been verified by KPMG. Site audits were carried out at Mulhouse in France and at Turku and Vaasa in Finland.

### Network company

A sales and service company, which in some cases may have a service workshop or an assembly/test line.

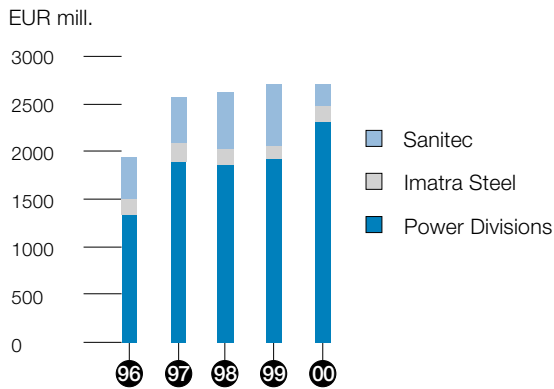
### Product company

A company, which has the functions of power divisions: Manufacturing, Marine, Power Plants, Service and Technology. Wärtsilä product companies are located in Finland, France, Italy, the Netherlands and Norway.

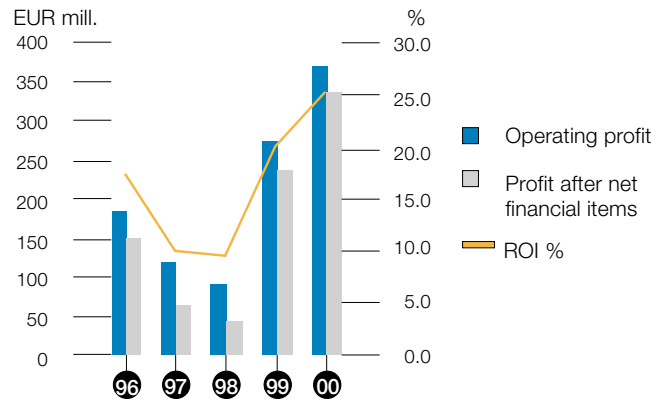
# Key Figures

## ECONOMIC

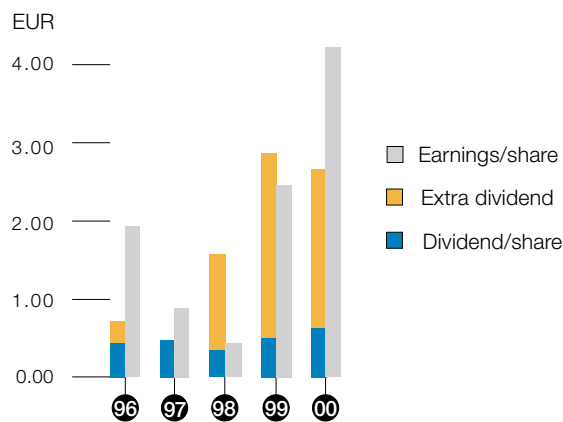
### Net sales



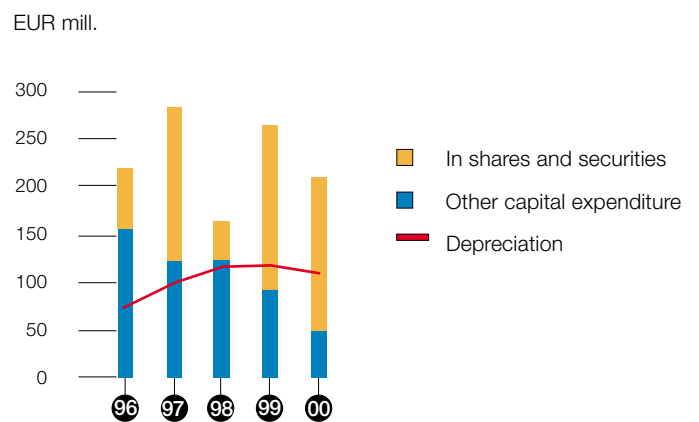
### Result



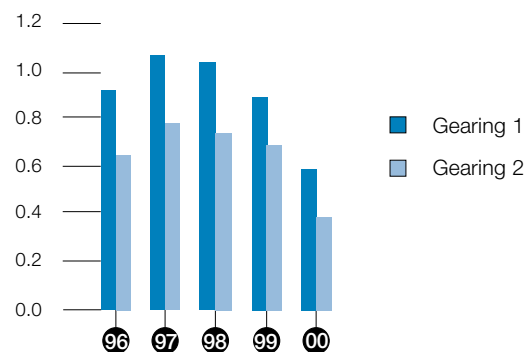
### Earnings/share Dividend/share



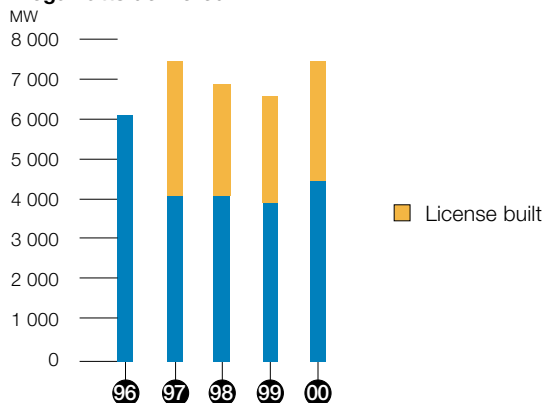
### Capital expenditure and depreciation



### Gearing



### Megawatts delivered







**ENVIRONMENTAL**

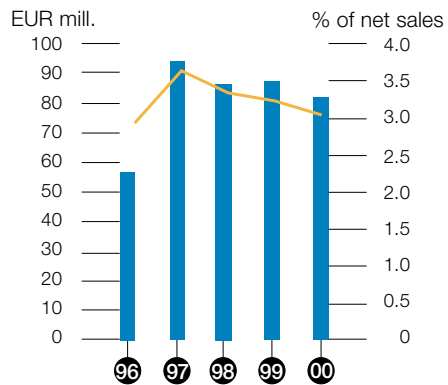
Wärtsilä's target is to gain ISO 14001 certification for all Wärtsilä product companies and the network companies with workshops by the end of 2001.

The following companies have gained the certificate (May 2001):

- Wärtsilä Deutschland GmbH
- Wärtsilä Sweden AB
- Wärtsilä Pakistan Ltd.
- Wärtsilä Philippines Inc.
- Wärtsilä Singapore Pte Ltd.
- Wärtsilä Taiwan Ltd.

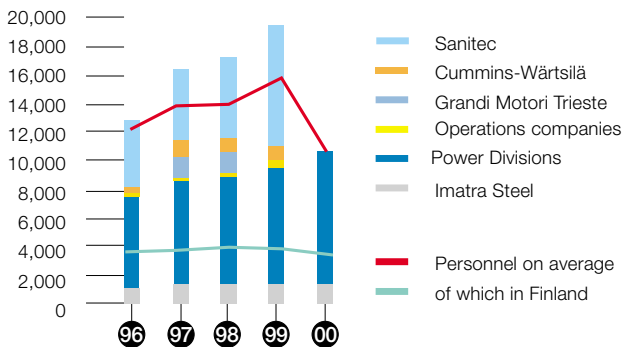
In addition one of Wärtsilä's special purpose companies, Columbia Energy Operations SA, have gained ISO 14001 certificate. Certification audits have also taken place in Wärtsilä Finland Oy and Wärtsilä Switzerland Ltd. and these companies are expected to gain the certificate during the summer 2001.

**R & D expenses**

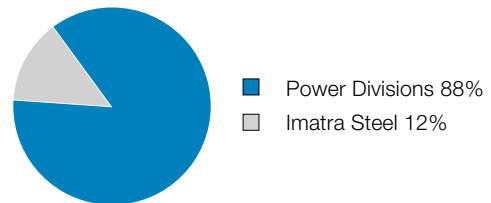


**SOCIAL**

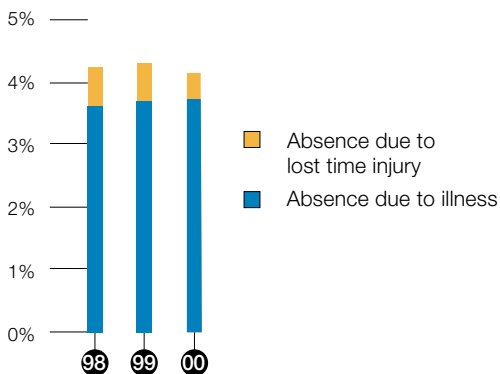
**Personnel by division**



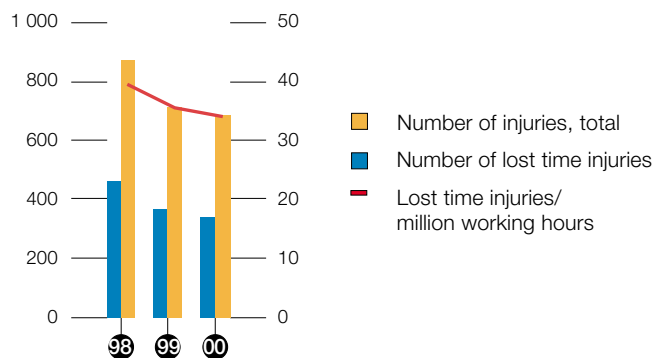
**Personnel by division end of 2000**



**Absence rate**



**Injuries**



# Wärtsilä's Strategy



## MISSION

We contribute to solving the global needs of sea transportation and power generation by developing equipment and services that convert fossil fuel into power efficiently and with the lowest possible environmental impact.

## VISION

Wärtsilä Corporation is the leading global ship power supplier and a major provider of solutions for decentralized power generation and of supporting services.

Our mission and vision mean that:

- We take responsibility for the total functionality of our system supplies.
- We maintain and develop a comprehensive service network capable of enhancing the value of our customers' equipment.
- Our operations are based on a network of long-term, high-value subcontractor relationships.
- We develop products that meet the strictest environmental criteria.
- We create value for our shareholders.

## STRATEGY

### Economic performance

Wärtsilä's economic performance consists of financial performance, economic value-added and wealth creation. However, we have focused more on financial issues in this report, because the reporting indicators of the economic value-added and wealth issues are still under further development within GRI.

Wärtsilä seeks growth. The annual organic growth target is 7% on average. Further growth will be achieved through acquisitions. Wärtsilä's target is to improve its performance by raising its operating profit to 7-8% of net sales. The solvency ratio target is 40%.

In Marine & Licensing and Power Plants Divisions Wärtsilä's target is to grow 4% a year. The annual growth target for Service Division is 10-15%. The target is to develop the service business so that it represents over one-third of the total net sales of the Power Divisions.

### Environmental performance

Environmentally advanced products

Wärtsilä's target is to develop and produce environmentally advanced products for its customer fulfilling all the vital

requirements. We require world-class environmental performance of our products by ensuring lifetime efficiency using advanced emission control technology with respect for the environment.

Wärtsilä's target is by the end of 2003 to:

- raise the volume of its gas power plant sales to half of its total power plants business
- provide an environmentally advanced product portfolio

### World class supplier

Wärtsilä's environmental target is to be a world class supplier. Wärtsilä places high priority on achieving sustainable development by means of raw materials, processes, products, wastes and emissions associated with enterprises taking into account the latest technical developments.

### Management systems

Wärtsilä's target is to implement and certify Environmental Management Systems based on ISO 14001 in all product companies and network companies with workshops.

### Social performance

The target of Wärtsilä's social strategy is to act as a good citizen wherever Wärtsilä is active. The framework and minimum level are set by the (local) legislation in force but the internal targets of Wärtsilä are in general higher.

With regard to our employees the basis for our social responsibility is given in the Road Map, underlining trust and respect as core values for the corporation. High standards in the field of occupational health and safety, good working conditions, equal opportunities and extensive development and training programmes are cornerstones in the Corporate HR Policy.

Management and employees engage in extensive social dialogue on company-level and corporate-level issues in National Works Councils and in the European Works Council.

Social responsibility is observed both at the global Wärtsilä level and in local product/network companies through involvement in different charity and similar projects. A good example is the support given by Wärtsilä India and its personnel as well as a matching Wärtsilä contribution to support people affected by the recent Gujarat earthquake.



## **Trust**

Create an atmosphere of mutual trust, teamwork and lack of politics to release energy in the organization.



## **Excellence and Best Practice**

Strive for quality and excellence in everyday work, be prepared to learn from others.



## **Creativity**

Be open to change, give new ideas a fair hearing.



## **Openness**

Promote openness throughout the organization in order to achieve a fruitful flow of information, suggestions and constructive criticism.



## **Respect**

Show every individual respect, irrespective of position and background.



## **Determination and "Sisu"**

Never give up, do not leave things half-done.

## Board of Management

Mr Ole Johansson, B Sc (Econ.), born 1951. President and CEO.

Mr Sven Bertlin, B Sc (Econ.), born 1944. Executive Vice President. Group Vice President, Manufacturing, Quality and Purchasing.

Mr Pekka Ahlqvist, M Sc (Eng.), born 1946. Group Vice President, Power Plants.

Mr Christian Andersson, LL.M., born 1944. Group Vice President, Human Resources, Administration and External Relations, Secretary to the Board of Management.

Mr Tage Blomberg, B Sc (Eng.), born 1949. Group Vice President, Service and Operations.

Mr Matti Kleimola, Lic. Sc (Tech.), born 1946. Prof., CTO, Group Vice President, Technology and Environment.

Mr Raimo Lind, M Sc (Econ.), born 1953. Group Vice President, CFO.

Mr Mikael Mäkinen, M Sc (Eng.), Naval Architect, born 1956. Group Vice President, Marine & Licensing.

## Environmental Report Project Team

Mr Matti Kleimola, Technology  
Mr Christian Andersson, Human Resources  
Mr Lars-Henrik Backas, Manufacturing  
Mr Stefan Gros, Power Plants  
Mr Peter Hansten, Technology  
Mrs Eeva Kainulainen, Corporate Communications

Mr Mika Laurilehto, Marine & Licensing  
Mrs Tuija Lindroos, Corporate Communications  
Mr Erik Pettersson, Manufacturing  
Mr Börje Smeds, Service  
Mr Marko Vainikka, Manufacturing  
Mr Rolf Vestergren, Technology

# Policies, Organization and Management Systems

**WÄRTSILÄ OPERATIVE EXCELLENCE SYSTEM - OPEXS**  
 Wärtsilä has created an Operative Excellence System (OpExS), which is intended to create added value for our stakeholders: customers, shareholders, personnel, suppliers and society at large. Wärtsilä OpExS is based on Corporate Manual and policies and directives and strategies approved by corporate management. The system itself consists of different kinds of tools, e.g. management systems for quality, environmental and occupational health & safety issues. All the Wärtsilä companies/divisions will implement management systems according to OpExS directives. The main principle within the management systems is to improve operational and product performance continuously. Each company/business unit sets objectives and targets to improve its performance. In addition the Power Divisions have defined Key Performance Indicators and targets for them in order to make improvement at corporate and division level.

The Wärtsilä Board of Management has overall responsibility for OpExS. The Board of Management defines the main strategies and targets and all the corporate-level policies

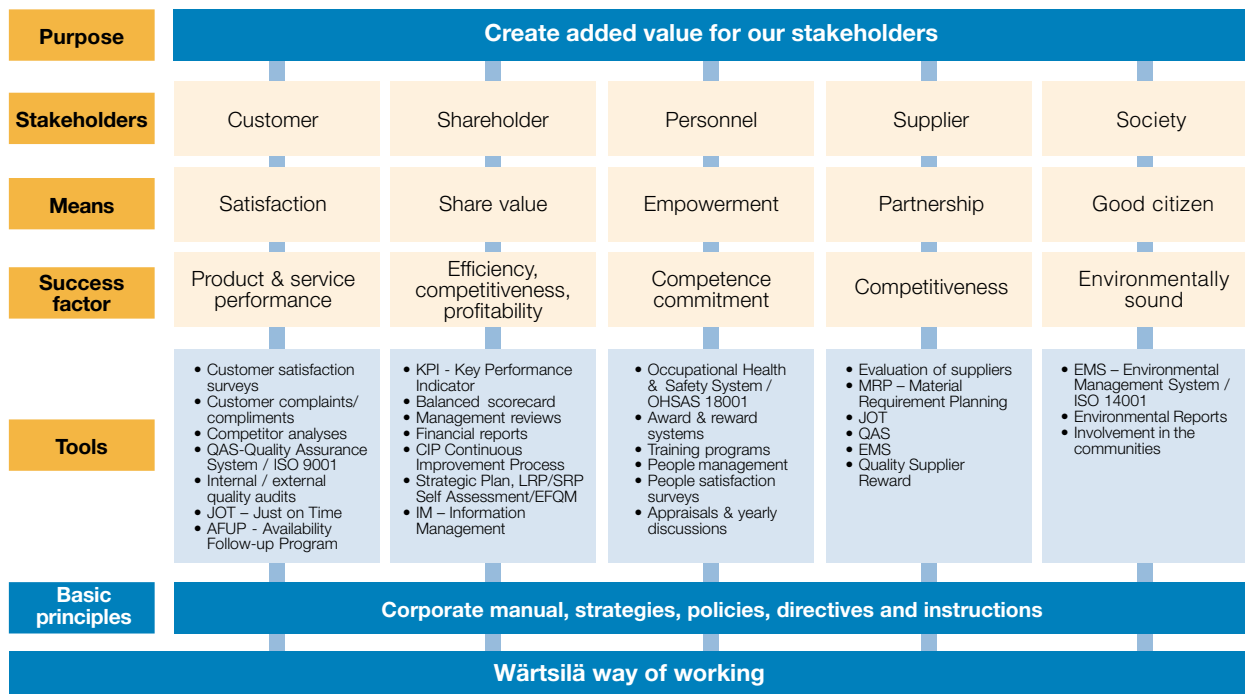
and directives, and it monitors their implementation and development of performance. In addition Wärtsilä has established an OpExS council which supports the units in this work.

The current status in implementation of management systems is presented in the following table:

Management system		
	Environmental ISO 14001	Quality ISO 9000 series
Share of certified Wärtsilä companies	18%	82%

Our aim is to gain ISO 9000 series certification for all Wärtsilä companies and ISO 14001 certification for all Wärtsilä product companies and the network companies with workshops by the end of 2001. The occupational health and safety system based on the OHSAS 18001 standard will have to be implemented in Wärtsilä by the end of 2002.

Wärtsilä Operative Excellence System





**Quality, environmental and occupational health and safety policies**

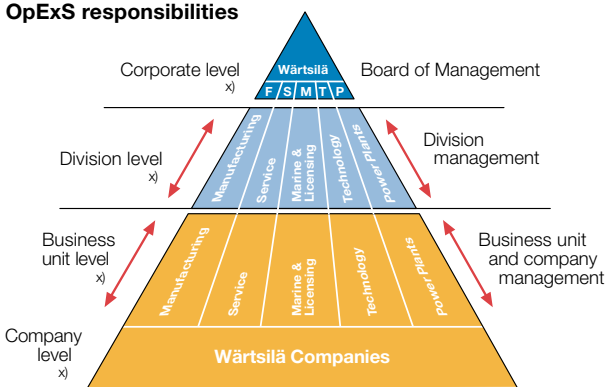
The Board of Management of Wärtsilä (BoM) has approved the following policies, which concerns the Power Divisions. The table presents the date of approval, key issues and persons responsible for the issue in top management.

Policy: Approved by BoM	Quality: 9 <sup>th</sup> September 1998	Environmental: 11 <sup>th</sup> May 1999	Occupational Health and Safety: 19 <sup>th</sup> January 2001
Key issues	<ul style="list-style-type: none"> <li>The purpose of our Quality Management System is to ensure that the customer receives the best possible service and that the products and systems supplied meet the agreed-upon requirements regarding reliability, economy and technical specifications</li> <li>The objective is to stay ahead of competitors by continuously developing our products and internal operations and by achieving a high level of customer-perceived product quality at optimized total costs</li> <li>Responsibility for quality lies with everyone</li> <li>Wärtsilä aims to work closely and continuously with suppliers and to improve quality by implementing quality assurance functions in suppliers' processes</li> </ul>	<ul style="list-style-type: none"> <li>We strive to reduce the adverse environmental impacts of our operations and products</li> <li>Our minimum requirement when considering operational solutions is compliance with laws and regulations related to environmental issues</li> <li>It's our aim to cover the whole supply chain and support our customers in developing efficient and sound procedures for environmental management</li> <li>Environmental performance is developed according to continuous improvement principles</li> <li>Everyone is responsible for environmental issues. We inform and educate our personnel on environmental care and protection as well as risk management within their areas of responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>The Group values and respects human life and consequently strives to provide a safe and hazard-free working environment and to minimize the adverse occupational health and safety impacts of our operations and products</li> <li>Our minimum requirement when considering operational solutions is compliance with the laws and regulations related to occupational health and safety issues</li> <li>Occupational health and safety performance is developed according to continuous improvement principles</li> <li>It's our aim to cover the whole supply chain and support our suppliers, customers and contractors in developing efficient and sound procedures for occupational health and safety management</li> <li>Responsibility in OH &amp; S issues is a matter for everyone</li> </ul>
Responsible person	Sven Bertlin, Executive Vice President; Group Vice President, Manufacturing	Matti Kleimola, Group Vice President, Technology	Christian Andersson, Group Vice President, Human Resources

**Basic OpExS organization**

Wärtsilä's management is fully committed to OpExS. Management reviews, covering management systems, are held at all management levels starting from top management down to the company's business unit management. Wärtsilä management reviews the implementation of the management systems, the functionality of OpExS and the development of performance related to the objectives and targets.

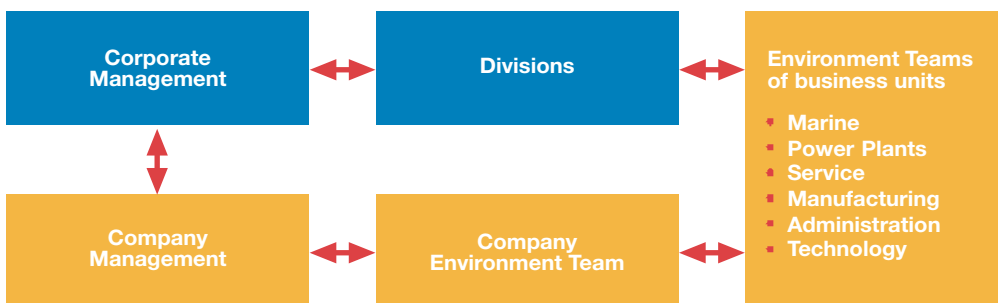
**OpExS responsibilities**



x) incl. HR, Finance, IM, Communication

As a rule, OpExS responsibilities at Wärtsilä are allocated according to line responsibilities. The corporate policies state that all personnel are responsible to assure that all environmental, quality and occupational health and safety issues are addressed. Each Wärtsilä company has defined responsibilities concerning management systems. The major units have their own environmental, quality and occupational health and safety teams, consisting of representatives from management and the business units. These teams develop operational methods and co-ordinate their implementation in each business unit.

**OpExS teams in Wärtsilä**



**STAKEHOLDER RELATIONSHIP**

Wärtsilä interfaces with its customers through its divisions. Customer decisions are increasingly influenced by the environmental impacts of the equipment Wärtsilä supplies. In this report we describe how we develop our products and collaborate with our customers in product development to minimize the environmental impacts of our products and systems.

To ensure that Wärtsilä products are environmentally sound in the fullest sense, Wärtsilä's component and service suppliers must likewise play an integral role in Wärtsilä's overall environmental operating model.

Since both customers and investors receive information via the media, we also briefly review Wärtsilä's relationships with the media in this report.

Environmental targets can be made part of everyday life only if every employee is committed to these targets. Training is one important way of ensuring that environmental issues are internalized and for this reason the report also forms part of our personnel's competence management.

The Wärtsilä companies are responsible for ensuring that local environmental issues related to operations are properly managed. In this respect the companies handle their relations with the main stakeholders: local customers, local authorities, local residents and neighbours.

Cooperation with employees on issues of importance to the entire Wärtsilä, which also includes environmental matters, takes place through the company's European Works Council. This forum brings together the personnel representatives of all the main European countries.



### Customers

Wärtsilä is continuously developing and enhancing long-term relationships with customers in the marine and power market. Wärtsilä offers support throughout the design, commissioning and operation of its products according to customer specific needs and external requirements.

Customer feedback is considered important and used in several ways. Customer information and feedback is collected through several channels such as daily feedback, reports, claims and surveys. Wärtsilä maintains close cooperation with customers in order to develop new technologies and concepts. For example, as environmental awareness increases and restrictions get stricter, cruise ship operators and their customers are paying particular attention to smoke emitted from cruise ships. Wärtsilä has responded to this demand and in cooperation with one of the world's leading cruise ship operators, has developed a smokeless diesel-electric propulsion system that combines common rail (CR) and direct water injection (DWI) technologies. These new technologies are a part of the EnviroEngine concept that includes environmentally sound technologies specifically designed to decrease emissions and smoke at all loads.

Wärtsilä continuously monitors customer satisfaction. Customer Satisfaction Surveys are performed regularly according to three-year plan set up by the Customer Satisfaction Steering Committee. The annually up-dated plan covering the three divisions (Marine & Licensing, Power Plants, Service) is coordinated between different geographical areas based on the location of customers. The Customer Satisfaction Steering Committee ensures that the surveys are conducted, that corrective action is taken and that the results are communicated both internally and externally.

### Investor and media relations

Wärtsilä regularly meets investors, financial analysts and the media. The company publishes its financial results four times a year and at the same time holds conferences for analysts and the business media to discuss the company's performance, business and targets with these stakeholders. Visits are also organized for the media and analysts to present special areas of Wärtsilä's operations. Environmental issues and Research and Development (R&D) to improve the environmental performance of the engines have been a discussion item during recent years. Every year Wärtsilä participates in the Investor Relations Barometer, which is conducted among financial analysts and the media in Finland and London. This Barometer measures the information needs of the financial community and media and the quality and appropriateness of the information Wärtsilä provides. The Wärtsilä image is also measured by corporate

image surveys among decision-makers, students and financial journalists. The product companies make local image studies within their respective area.

### Personnel

The company had 10,564 employees at the end of 2000. Employee feedback has been received through various employee satisfaction studies and through an extensive study on internal communication, and several measures have been implemented in response to the conclusions of this study. Performance tracking covering 750 managers was conducted at the end of the year repeating a similar study in mid-1999. This study revealed a clear improvement in employee satisfaction and customer focus while simultaneously identifying several areas for further action.

Consultation of corporate issues between management and employees takes place through National and European Works Councils. The European Works Council has been involved in creating the Wärtsilä Occupational Health and Safety Policy and Directive, which has been integrated to the framework of the Wärtsilä OpExS.

Wärtsilä has a strong commitment towards training its employees. Most training programmes are designed and implemented by the Corporation, the Divisions and the product and network companies. A new Wärtsilä Academy is being established to offer a learning platform with several training programmes on different levels and optional modules and projects in between.

Training needs are mapped through an extensive assessment procedure, which today covers more than 400 managers, and as a part of the annual discussions between team managers and members.

Environmental training is part of the OpExS, which is being implemented in the whole group. In Finland, for example, environmental training has been organized for the personnel since 1998, and today every employee in the Finnish product company has received environmental training. A special Environmental Guide to support this training has been published in Finland. The guide is a practical tool for every employee to help them to consider environmental issues in their everyday work.

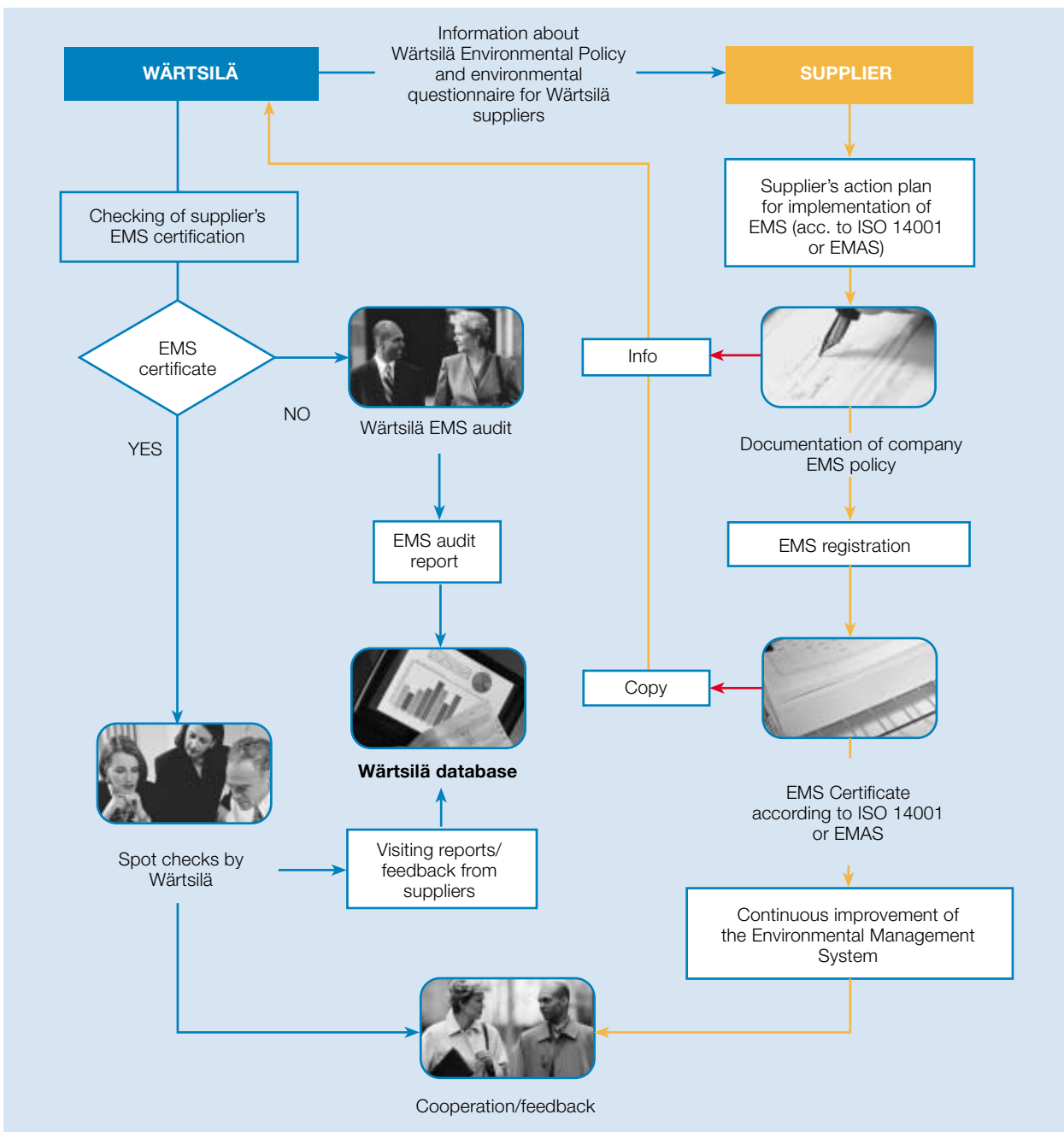
Training has always been an important part of the efforts to avoid health and safety risks in the different group companies. The new Occupational Health and Safety Policy and Directive state explicitly that the employees must be made aware of the OH&S procedures at all relevant organizational levels and that the OH&S management system must be introduced to new employees. The training and educational needs in this field will be identified and appropriate training organized.

**Suppliers**


Wärtsilä has evaluated its major suppliers by sending questionnaires to them. Last year these questionnaires were sent to 146 Wärtsilä global suppliers located all over the world. Based on the replies we evaluate our suppliers' environmental performance and prepare our annual supplier audit plan. Suppliers who do not have a certified environmental management and quality assurance system will be

audited first. Suppliers who do not meet our environmental or quality requirements will also be audited in order to ensure they take the necessary corrective action.

Our transportation strategy is to ensure the safe, cost-effective and on-time delivery of the products to our customers and to our factories. We use several transportation partners owing to the global nature of our operations. When we select new transportation partners we prefer companies that can







demonstrate sound environmental performance. Our transportation partners are part of our supply chain and we set the same kind of quality and environmental requirements for them as for our other suppliers.

#### **Wärtsilä and its neighbours**

Wärtsilä has six product factories in Europe and six assembly factories mainly located outside Europe. Sales and service offices are located in about 50 countries. In many countries the factories are located in the middle of a city surrounded by residential areas. Information about our operations and their impact on local environment and people is produced regularly. The product companies regularly organize open house events for inhabitants in the area.

#### **Cooperation with the authorities**

Wärtsilä maintains constructive cooperation with the relevant authorities regarding the environment and occupational health and safety issues. Locally, Wärtsilä companies cooperate with the local regulatory authorities. Open communication with our local authorities has ensured that the authorities are well aware of our operations and current environmental and occupational health and safety performance.

#### **Participation in the activities of industrial and international organizations**

Wärtsilä is an active member of the working groups of the Confederation of Finnish Industries and Employers, the Chamber of Commerce and the Confederation of the Metal and Engineering Industries. Wärtsilä also participates in the work of international organizations like the European Association of Internal Combustion Engine Manufacturers (Euromot), the Conference Board, the International Maritime Organization (IMO), the European Committee for Standardization (CEN), the International Organization for Standardization (ISO) and the International Council on Combustion Engines (CIMAC), the International Institute for the Management Development (IMD) and the European Foundation for Quality Management (EFQM).

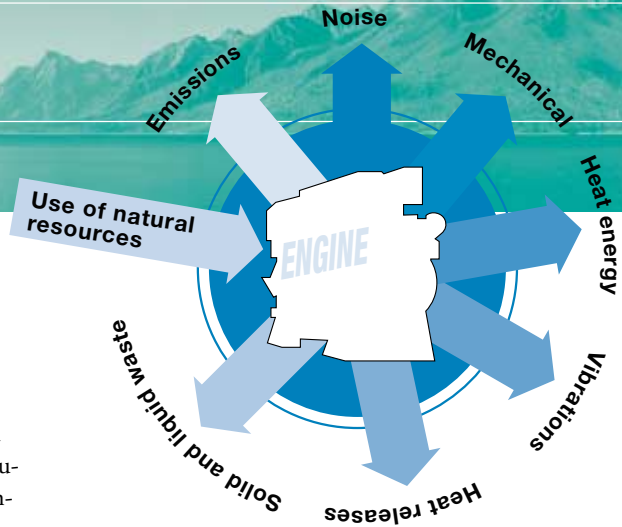
The World Bank environmental guidelines are setting the trend in many areas of the world where specific regulations for power plants based on reciprocating engines may not yet exist. Wärtsilä reviews these guidelines annually and informs the World Bank about the development of new environmental abatement technologies. Wärtsilä also participate in the following associations dealing with power plant performance and emissions: Cogen Europe, VDMA in Germany and SCSMI in France. The contact to UNECE is organized via the environmental ministries. Wärtsilä's companies take part in work of industrial and business organizations in their respective areas.

#### **Voluntary agreements**

Wärtsilä has committed to the following voluntary agreements:

- In 1998 Wärtsilä Finland Oy has signed the Voluntary Agreement to Promote Systematic Use of Energy. Since 1998 Wärtsilä Finland Oy has made an Energy analysis of its premises in order to increase the efficiency of energy utilization.
- Wärtsilä Nederland B.V. is committed to the development programs of the Federation of Metal and Electrical Companies in the Netherlands. The federation sets objectives for example for energy utilization, VOC and waste reduction.

# Product Environmental Performance



The thrust of Wärtsilä's R&D activities has for a long time focused on minimizing environmental impacts. Many of Wärtsilä's customers aim to show leadership in environmental responsibility and the company supports this goal unreservedly. As new technology provides further opportunities to reduce environmental impacts, interest in environmental issues has further increased in recent years.

In Wärtsilä's business environmental pollution is regulated at the international level mainly by the IMO (International Maritime Organization), and the World Bank. In addition incremental port charges are levied at the national level to reduce emissions by shipping. Wärtsilä's engines fall well below existing environmental restrictions but its goal is to reduce emissions still further using new technology. Wärtsilä's environmentally sound product range gives it a clear competitive edge in markets where environmental issues are being given increasingly high priority.

## ENERGY

### Fuels

The world will continue to be dependent on fossil fuels during the decades ahead. The International Energy Agency (IEA) estimates that by 2010-2020 fossil fuels will account for about 90% of the market for global primary energy consumption – the same as today. Although oil will continue to play the most important role in this scenario still for a long time to come, we are already seeing a shift to natural gas. After the year 2050 natural gas is expected to become the main source of energy. In the longer term, renewable energy sources will increase their market share as well, due to the need for achieving the greenhouse gas emission targets.

*By environmental aspects we refer to those elements of practices, products and services that have an effect on the environment. Environmental impacts can be either positive or negative.*

*The environmental aspects of a product are mainly connected to its use. Wärtsilä engines produce mechanical and thermal energy. The use of fuels and lubricants in engines results in different types of exhaust emissions and waste. Exhaust gases and engine cooling produce waste heat to air and water. Part of the thermal energy can be utilized for combined heat and power plants, for example. Engine operation also causes noise emissions.*

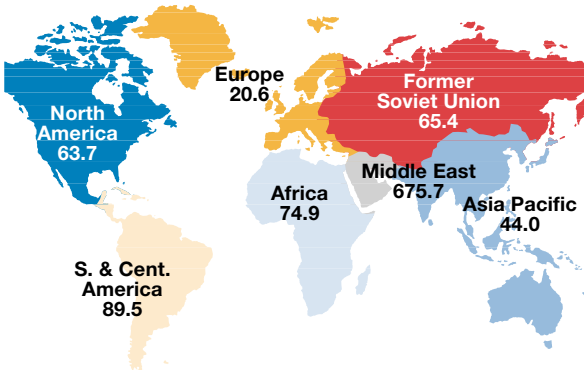
Fuel versatility is thus a major issue for the future. Wärtsilä is devoting a substantial part of its R&D efforts to this area. The multi-fuel engine alternatives now offered by Wärtsilä give customers a means of securing low-cost and environmentally sound solutions for the future. The engine alternatives offer the flexibility of burning heavy fuel oils today, gas today and/or tomorrow and even renewable fuels in the future.

### Status of fuel versatility - Wärtsilä engines

Current standard production engines can operate on: Distillate fuel (light fuel oil, gas oil), Heavy fuel oil (residual

## Fuel reserves

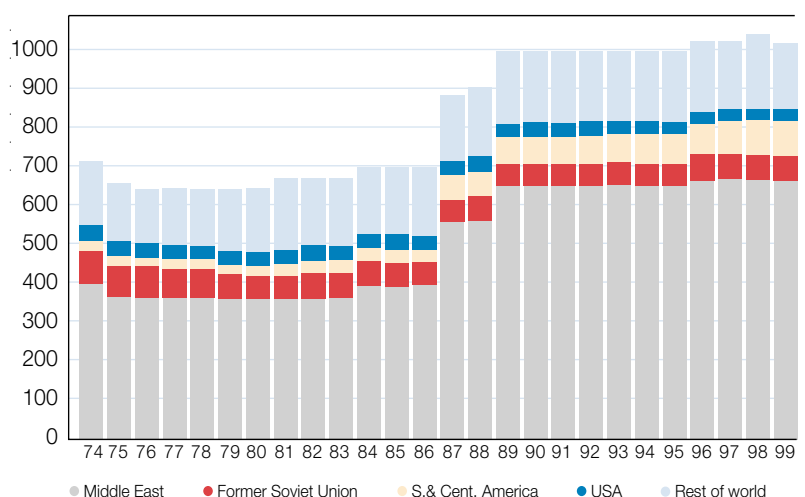
Thousand million barrels



The world's proved oil reserves continue to be dominated by the Middle East which holds almost two-thirds of the total.

Source: BP statistical review of world energy 2000

Thousand million barrels

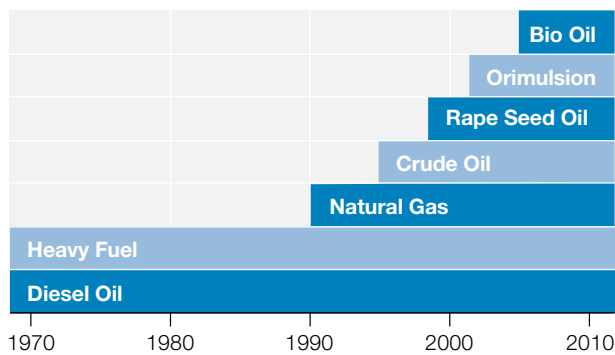


● Middle East ● Former Soviet Union ● S. & Cent. America ● USA ● Rest of world

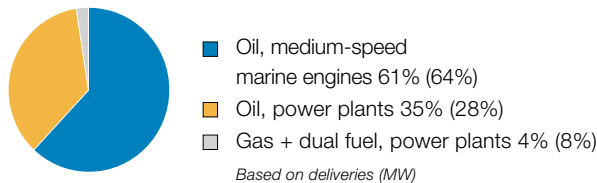
fuel), Natural gas - also liquefied or compressed, Liquefied petroleum gas and Gas and liquid fuel simultaneously (dual-fuel engines).

Tested and commercially available are engines for operation on: Crude oil and rapeseed oil.  
Subject to development are engines for operation on: Orimulsion and bio oils.

**Status of fuel versatility - Wärtsilä engines**



**Wärtsilä's fuel breakdown 2000**

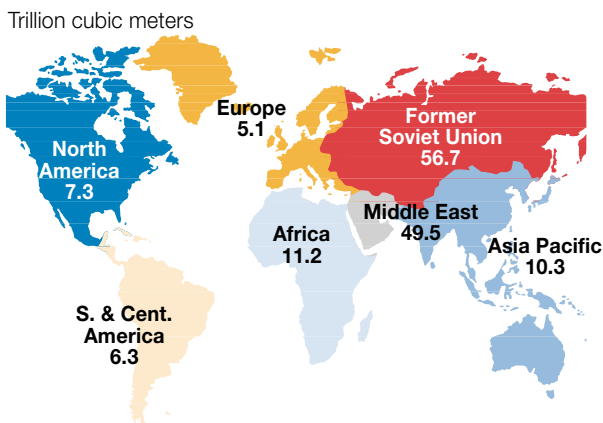


**Energy efficiency**

The energy produced is used for powering ships or alternatively when connected to an alternator for production of electricity. In both cases high energy efficiency is essential for best utilization of the existing fuel resources and for minimizing costs and exhaust gas emissions. The emissions of sulphur and carbon dioxide are directly proportional to the specific fuel consumption when comparing operation on the same fuel quality. High energy efficiency is mostly the result of good combustion, thus also minimizing the emissions of unburned compounds such as carbon monoxide, hydrocarbons and particulates.

Reciprocating engines have the highest energy efficiency among simple cycle prime movers i.e. lowest fuel consumption and therefore lowest specific CO<sub>2</sub> and SO<sub>2</sub> emissions for a given fuel quality. Typical energy efficiencies for a simple cycle application are 40-49% and for a combined cycle application 45-55% (shaft efficiencies). High efficiency is achieved in a broad load range, typically 30-100%.

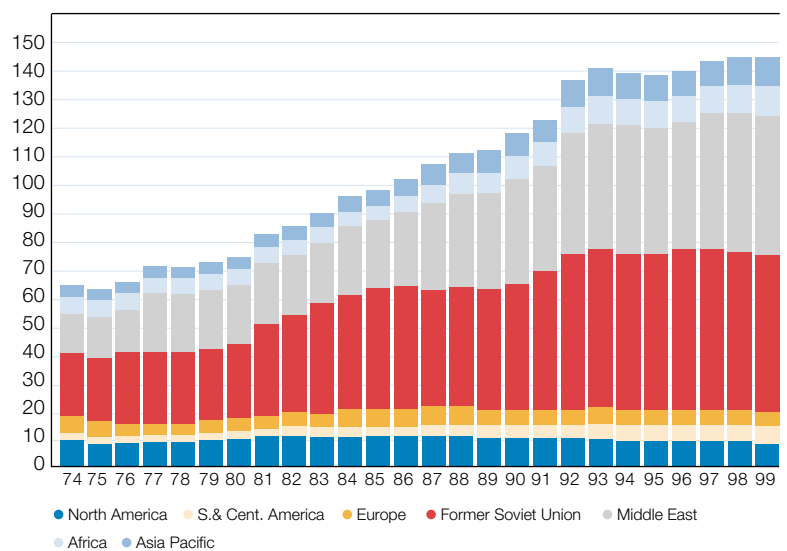
The high efficiency at part load together with the consecutive utilization of engines in a multi-engine installation enable highly efficient power production in a broad load range. This enables very low power plant turndown ratios to as low as 10% with excellent plant efficiency. In multi-engine installations it is also possible to perform service work on part of the plant while the rest continues to produce power and heat.



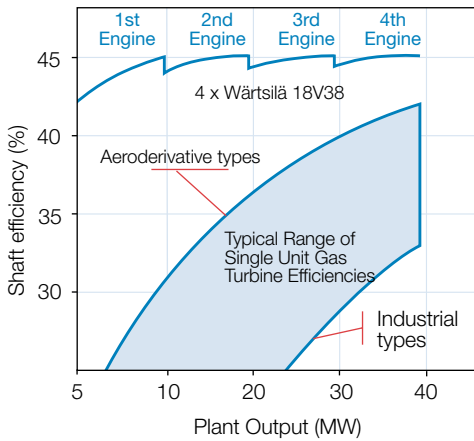
World proved natural gas reserves were virtually unchanged in 1999 as gains in Africa and Asia Pacific offset a reduction in North America.

Source: BP statistical review of world energy 2000

Trillion cubic meters



**Shaft efficiencies versus power output (ISO 3046 II – Conditions)**



Example of power plant (40 MW) efficiency at part load.

In recent decades the energy efficiencies of Wärtsilä engines has increased substantially from about 40% two decades ago to a current level of about 49%. This development trend reflects both better engine performances and bigger engine sizes. Engine efficiencies have generally increased as a result of increased firing pressures, higher compression ratios, shorter fuel injection durations, optimized valve timings and improved combustion processes. The development of efficiency in Wärtsilä's products has a significant impact on the environment from the life cycle point of view. We have focused on energy efficiency in our research and development because of the long life cycle of our products.

**Combined heat and power (CHP) and decentralized energy production**

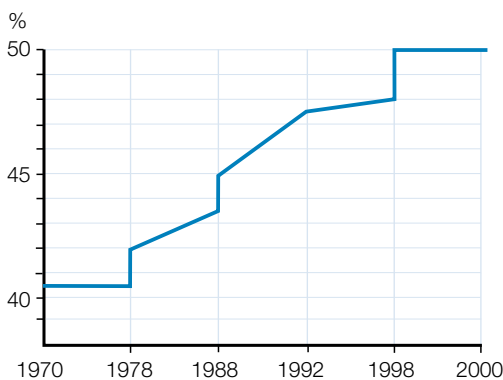
CHP means recovering and using the heat produced as a by-product of the electrical generation process. The usual method is to use the waste heat from the engine exhaust gases or engine cooling systems to produce hot water or steam generation from engine exhaust gases or engine cooling systems. Typical CHP solutions are district heating, steam or hot water for various industrial processes, and desalination. The heat can also be used as an energy source in chillers for air conditioning or cooling.

Wärtsilä provides CHP solutions based on engines running on gas or oil with plant electrical efficiencies at the generator terminal in the range 40-45% and heat efficiencies of 35-45%. This implies total efficiencies from 75% to 90%. Instead of using additional fuel or electricity for heat generation, the plant heat is used. In addition to conserving fossil fuel resources, this also results in less fuel related emissions. Also the heat emitted to the air and water is reduced, with less disturbance on the ecosystems.

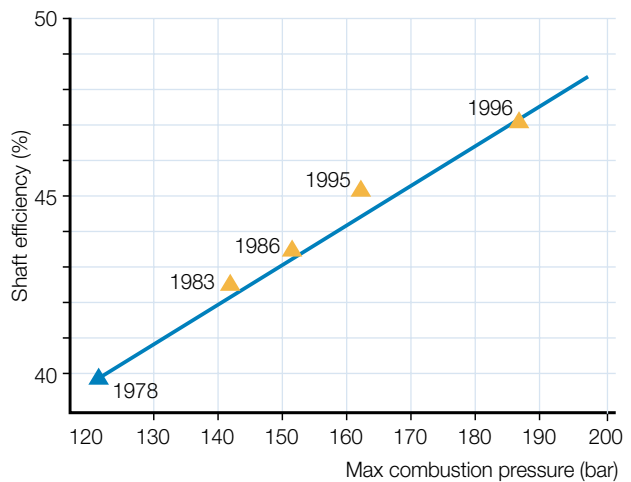
In recent years we have seen a clear trend from large centralized power plants to smaller decentralized solutions. This is the result of a wide variety of factors, the most important ones being deregulation and liberalization, fast changing markets and environmental considerations. Liberalization and fast changing markets favour small plants with short lead times.

Environmental considerations also favour distributed power solutions. The shift from coal to gas reduces CO<sub>2</sub> emissions and greenhouse effects. For logistical reasons, coal

**Highlights of shaft efficiency development at Wärtsilä**



**Shaft efficiency of Wärtsilä 32 engine**

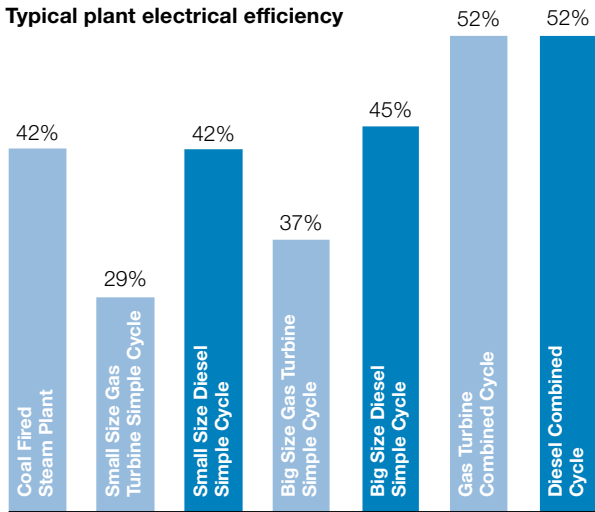


The development of shaft efficiency on the Wärtsilä 32 engine.



Valkeakoski Power Plant in Finland

**Typical plant electrical efficiency**



- Wärtsilä product
- Non-Wärtsilä product

tends to require big power units, while gas makes small CHP units possible. The local environmental impact of a big power plant is somewhat more difficult to assess because of elevated concentrations of emissions at ground level. The feasibility of using emission control equipment in big power plants is better, however, owing to economics of scale. CHP plants suit distributed power solutions. A CHP plant has a total efficiency of typically 75-90% compared to a big coal fired plant with a typical electrical efficiency of 35-40%. A centralized plant also requires long transmission lines with transmission losses. The construction of long transmission lines is also an environmental concern.

The Valkeakoski power plant is a typical example of a small-distributed CHP solution. The electrical efficiency is 42% and the heat efficiency is 46% giving a total efficiency of 88%.

**EMISSIONS TO THE AIR**

Carbon dioxide and sulphur dioxide

Emissions of sulphur and carbon dioxide are fuel related; they are entirely a function of the carbon and sulphur content of the fuel and the specific fuel consumption of the process.

CO<sub>2</sub> and SO<sub>2</sub> emissions can be reduced by increasing the total energy efficiency of the plant or/and by using oil instead of coal, natural gas instead of oil and bio fuels instead of gas. Other measures to reduce CO<sub>2</sub> and SO<sub>2</sub> emissions are increased CHP production in efficient decentralized power plants and replacing old inefficient power stations with new efficient solutions. No technically viable method yet exists for removing CO<sub>2</sub> from the exhaust gas. Only a few diesel power plants are equipped with DeSO<sub>x</sub> capabilities at the moment.

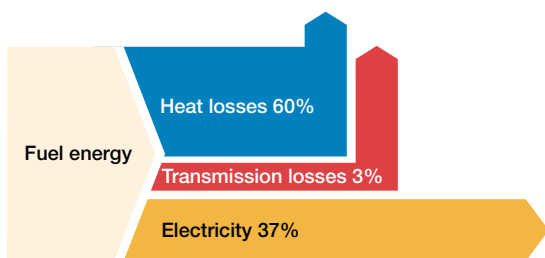
Carbon dioxide is the main greenhouse gas, i.e. the gas that contributes most to the greenhouse effect the potential climate change caused by global warming.

In the Kyoto protocol (Dec. 1997) a target on the reduction of greenhouse gases, of which CO<sub>2</sub> is considered the most important one, was established by reducing the global anthropogenic greenhouse gas emissions by at least 5% below 1990 levels in the commitment period 2008-2012. Consequently, the preferred power technology options in the post-Kyoto world are power production processes based on high energy efficiencies and especially gas fuel operation and cogeneration. Compared to large centralized coal-fired power plants, CHP plants achieve primary fuel savings in the region of 30-40%, and carbon dioxide emission reductions of about 50-60% when using oil and 60-70% when using gas.

**Centralized and decentralized power production**

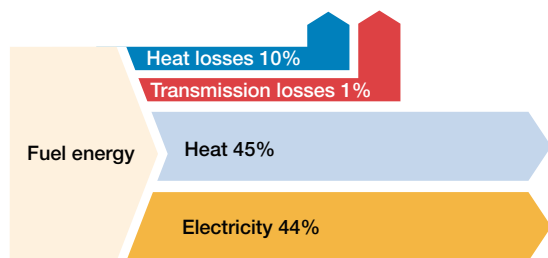
**Typical centralized thermal power plant**

- Comprehensive transmission systems/losses
- CHP difficult to apply
- Poor total efficiencies
- Better economics of scale for cleaning equipment



**Typical decentralized diesel power plant**

- Small transmission systems/losses
- CHP easy to utilize
- High total efficiencies



**Nitrogen oxides**

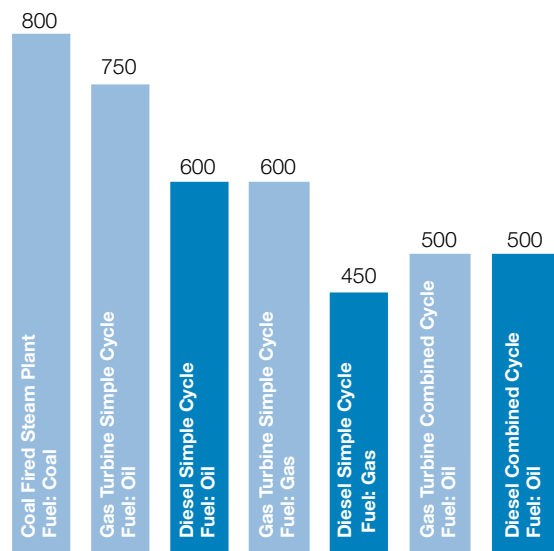
Nitrogen oxides (NO<sub>x</sub>) are formed in the combustion process inside the engine cylinder. The main source of NO<sub>x</sub> is the oxidation of atmospheric nitrogen; only a minor part originates from the nitrogen content of the fuel. NO<sub>x</sub>-formation is a function of local high-temperature areas and their duration during combustion. To be able to reduce NO<sub>x</sub> emissions we must either prevent formation in the cylinder (called a primary method) or remove the NO<sub>x</sub> from the exhaust gases in an after-treatment system (secondary method).

Wärtsilä's primary methods for reducing NO<sub>x</sub> emissions in diesel engines comprise in-cylinder combustion control measures (Low NO<sub>x</sub> Combustion) and injection of water directly into the combustion chamber (Direct Water Injection).

NO<sub>x</sub> reduction using Low NO<sub>x</sub> Combustion technology ranges between 25% and 35% with unaffected or slightly improved engine specific fuel consumption. Direct Water Injection reduces NO<sub>x</sub> emissions typically by 50-60%.

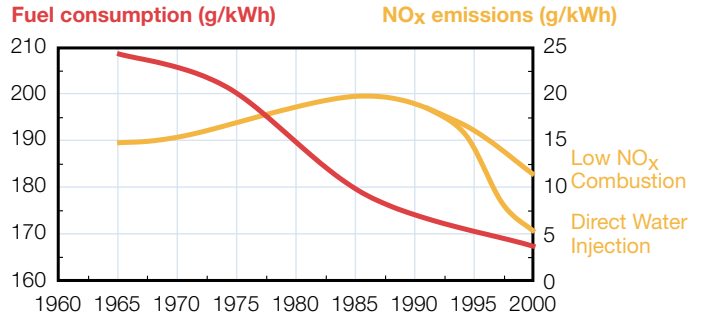
The Wärtsilä Otto-type gas engines operate on a very lean fuel and air mixture (premixed outside the cylinder). This results in a smooth distribution of relative low temperatures all over the combustion space, which minimizes NO<sub>x</sub>-formation.

**CO<sub>2</sub> in g/kWh produced electricity**



- Wärtsilä product
- Non-Wärtsilä product

Typical specific CO<sub>2</sub> emissions.



Development of diesel engine specific fuel consumption and NO<sub>x</sub> emissions

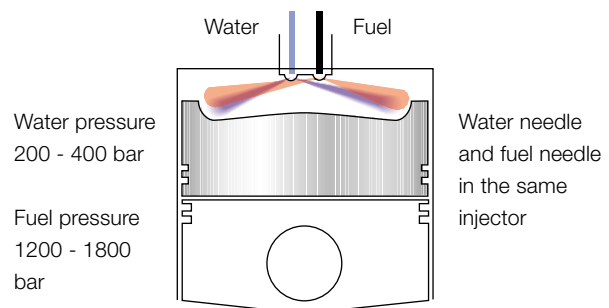
**The smokeless engine**

Visible smoke has recently become a major issue in the marine market, especially for cruise and passenger ships. Since most harbours in the world are located close to densely populated areas, it can be foreseen that the demand for no visible smoke under any circumstances will become increasingly important in the future.

Wärtsilä diesel engines are known on the market for their clean smoke due to measures already taken many years ago i.e. preheating of the charge air, introduction of turbochargers able to operate at high efficiency at part load, optimization of the combustion space and keeping the fuel injection pressure high. These methods ensure that Wärtsilä engines emit no visible smoke at loads above 25%.

In order to avoid visible smoke at even lower loads it is necessary to prevent fuel droplets coming into contact with metal surfaces around the combustion space. The big potential in achieving this lies in the fuel droplet size. With conventional mechanical injection systems the fuel injection pressure is a function of engine load. At low load the fuel

**Principle of direct water injection**





The first Sulzer RT-flex (Common Rail) engine completing its official shop test. This 6RT-flex58T-B engine develops 12,750 kW.

Wärtsilä 32 Common Rail

injection pressure drops resulting in large fuel droplets which survive as droplets until they touch the combustion space surfaces, generating smoke emissions. This situation can be changed using common rail fuel injection technology. This system keeps the injection pressure high and constant over the whole load range, thus enabling operation without visible smoke over the whole operation field.

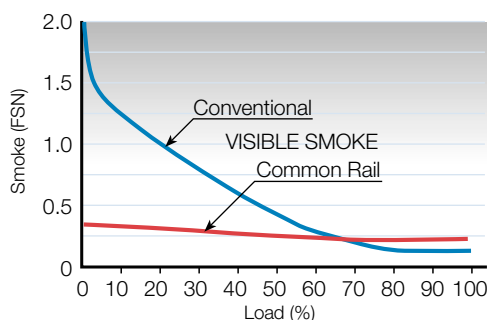
#### EMISSION REDUCTION TECHNOLOGIES

Traditionally the main emission concerns for diesel engine driven power plants have been NO<sub>x</sub>, SO<sub>x</sub> and PM (particulate matter). Particle emissions are receiving increasing attention today, as are also THC (Total Hydrocarbons), especially in the case of gas engines.

#### NO<sub>x</sub> reduction

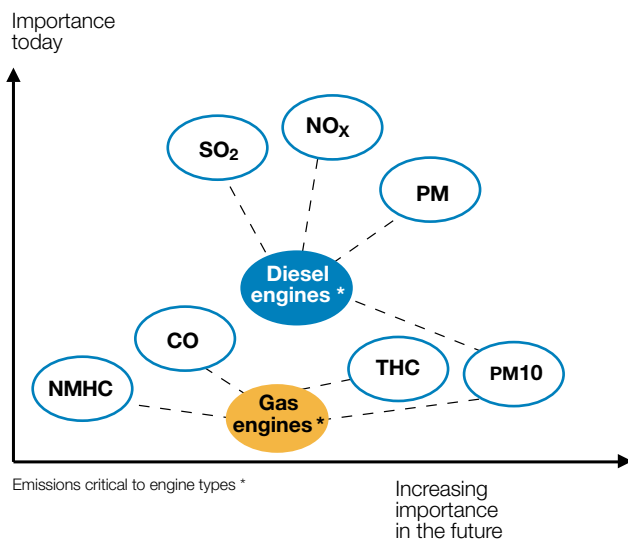
Wärtsilä has focused on both primary and secondary NO<sub>x</sub> reduction techniques. The main NO<sub>x</sub> reduction methods besides engine tuning are water injection and SCR (Selective Catalytic Reduction). In an SCR reactor a reducing agent (ammonia or urea) reacts with NO<sub>x</sub> to form water and nitrogen. Between 1990 and 1996 Wärtsilä conducted

#### Smoke comparison between conventional and Common Rail FIE at 750 rpm



extensive laboratory tests and standardization work with SCR techniques using both ammonia and urea. This mainly involved low sulphur heavy fuel oils and light fuel oils. The SCR technique reduces NO<sub>x</sub> by 85 – 95%. The development of DWI for NO<sub>x</sub> reduction was developed in parallel with the SCR technique as an alternative especially for marine installations.

#### Focus on emissions from engine-driven power plants



#### Abbreviations

NO<sub>x</sub> = oxides of nitrogen

SO<sub>2</sub> = sulphur dioxide

PM = particulate matter

PM10 = particulate matter, diameter is smaller than 10 micrometres

THC = total hydrocarbons

NMHC = non-methane hydrocarbon

CO = carbon monoxide

**SO<sub>x</sub> reduction**

SO<sub>x</sub> emissions depend on the sulphur content of the fuel. Cheaper high sulphur fuels may require the use of DeSO<sub>x</sub> systems. Methods suitable for diesel engine applications are alkali scrubbing and semidry DeSO<sub>x</sub> using quicklime or calcium carbonate scrubbers with gypsum as the end product.

Alkali scrubbers were adapted and standardized for SO<sub>x</sub> reduction between 1993 and 1996 in cooperation with subsuppliers. This DeSO<sub>x</sub> method has low investment costs and is suitable for small power plants.

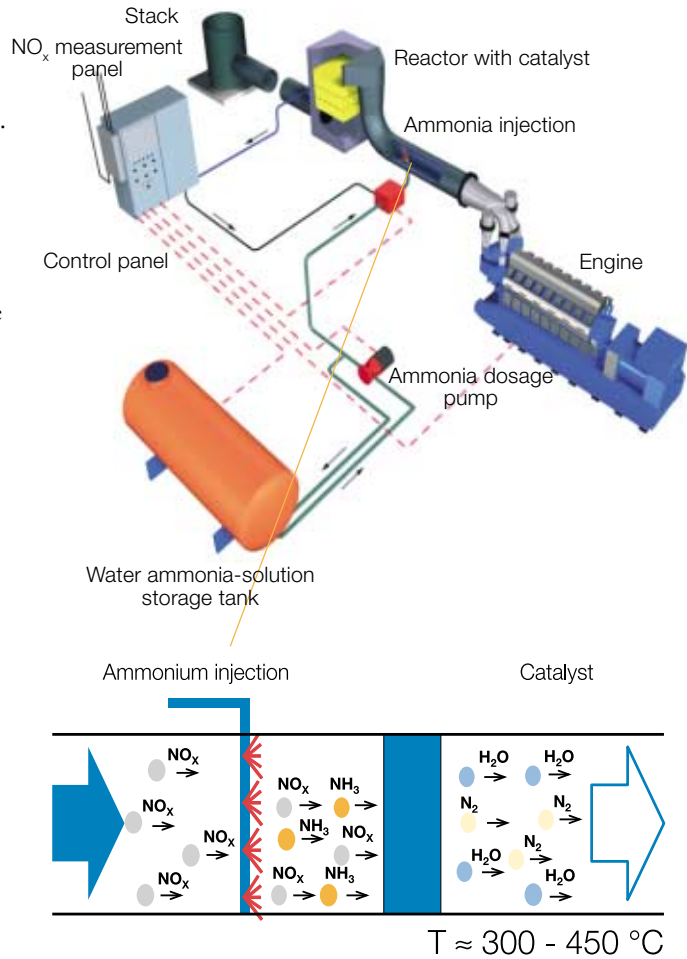
Semidry DeSO<sub>x</sub> is method suitable for larger diesel power plants and in most cases its operating costs are low. Full-scale operation of semidry DeSO<sub>x</sub> has been carried out since 1998 with good results. The first Wärtsilä engines equipped with calcium carbonate scrubbers have been sold and will be commissioned during 2001.

**Particle reduction**

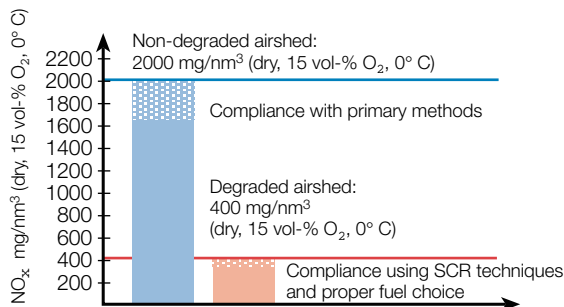
Diesel engines in automotive fleets are continuously accelerated and decelerated, giving rise to particle emissions containing unburned and partly burned traces of fuel.

A diesel power plant, however, operates at a steady speed and load, and therefore mainly emits particles containing oxidized ash originating from the heavy fuel oil. Wärtsilä installed the first ESP (Electrostatic Precipitator) on a diesel engine in 1999. After comprehensive testing and operation this method has now been released for use in Wärtsilä power plants. The semidry DeSO<sub>x</sub> method mentioned above also includes filters which remove the diesel particles and the reacted quicklime.

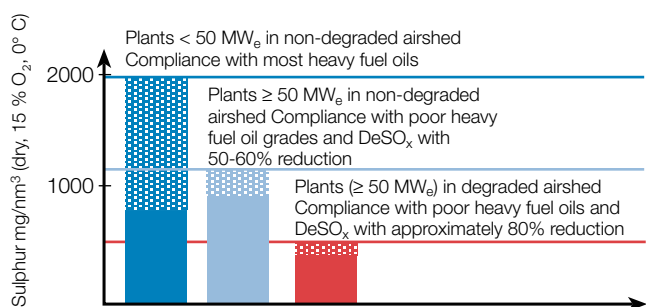
**SCR (Selective Catalytic Reduction)**



**NO<sub>x</sub> emission compliance of Wärtsilä products with World Bank 1998 Guidelines**

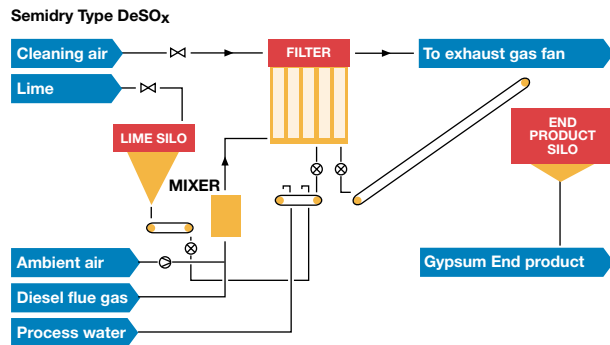


**SO<sub>x</sub> emissions compliance of Wärtsilä products with World Bank 1998 Guidelines**





### The principle of semidry type DeSO<sub>x</sub>



### COMPLIANCE

#### Power Plants

Wärtsilä's product development strategy for diesel power plants is to fulfil the World Bank's stack emission guidelines for non-degraded airshed using primary methods and with an appropriate fuel choice. For degraded airshed or other stricter national environmental regulations secondary cleaning methods such as DeNO<sub>x</sub>, DeSO<sub>x</sub> and particle reduction techniques must be used. Compliance with GLC (Ground Level Concentrations) regulations is the responsibility of the power plant owner and is dependent on the initial level of local emission concentrations defined by traffic, other industries and local ambient conditions etc.

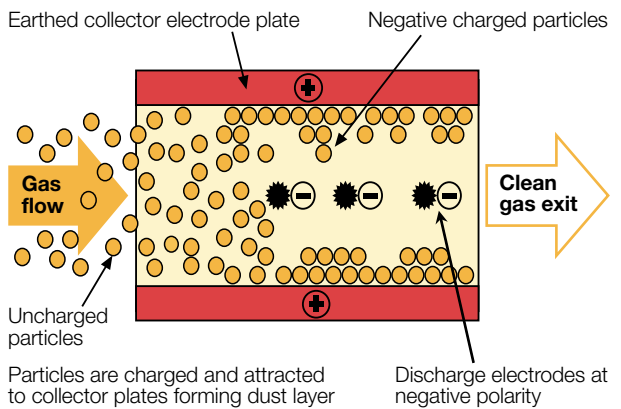
TA-Luft regulations in Germany have been widely used for power plants based on lean-burn gas engines and these regulations are referred to in many other countries. Wärtsilä's strategy is to fulfil the TA-Luft regulations using primary techniques. For more stringent regulations cleaning techniques such as DeNO<sub>x</sub> and various oxidation catalysts may be required.

Environmental guidelines on noise vary considerably from one country to another and even more in different surroundings such as urban areas, industrial zones and rural districts. To meet the various regulations Wärtsilä has developed different building concepts that prevent the propagation of engine hall noise. Similarly, exhaust gas silencer technology and low noise radiator concepts are of high importance when reducing noise.

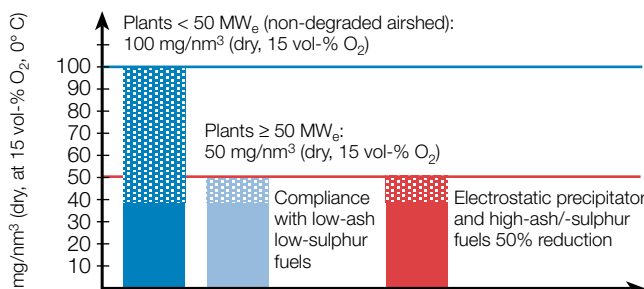
### Marine

Wärtsilä's marine engine development strategy states that all Wärtsilä and Sulzer engines for marine use shall as a minimum comply with the requirements of the International Maritime Organization (IMO). In addition Wärtsilä is also developing NO<sub>x</sub> reducing technologies like DWI and SCR to comply with even more demanding national or regional legislation. The NO<sub>x</sub> reducing potential of these technologies is shown in the enclosed figure.

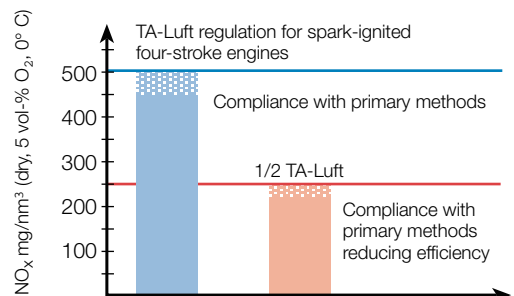
### The principle of ESP (Electrostatic Precipitation)



### Particle emissions compliance of Wärtsilä products with World Bank 1998 Guidelines



### NO<sub>x</sub> emission compliance for gas engine power plant





**INSTALLATIONS OF EMISSIONS REDUCTION TECHNOLOGIES**

Environmental matters are a subject of concern among both marine and power plant owners. Wärtsilä has focused a lot of effort on finding efficient ways to reduce the exhaust emissions of diesel engines.

Particular emphasis has been given in land-based and onboard power generation to reducing NO<sub>x</sub> emissions. Direct Water Injection technology has been designed and employed by Wärtsilä as a primary method. The first DWI installations were commissioned in 1999. The secondary NO<sub>x</sub> control method adopted and further developed for Wärtsilä engines is Selective Catalytic Reduction (SCR). The first of these installations were commissioned in 1990.

Reducing SO<sub>x</sub> emissions in land-based plants has also been included in the Wärtsilä delivery portfolio for quite some time. The first plants equipped with DeSO<sub>x</sub> devices were commissioned in 1993.

**WATER CONSUMPTION**

Ground water, as a source for the production of potable and industrial water, is a natural reserve like oil and gas. In many regions water resources are becoming increasingly sparse.

The Silja Symphony cruise ferry and her sister vessel Silja Serenade are both equipped with Direct Water Injection on all main engines, total installed power 32.5 MW. Furthermore, one of the auxiliary engines with an output of 3 MW has been equipped with a Selective Catalytic Reduction unit.

This is why special attention is paid to power plant configurations that consume small quantities of water. Power plants based on diesel or gas engines using air radiator cooling are especially suitable if water consumption is important factor. Likewise, diesel installations based on cooling towers use less water than steam boilers based on cooling towers.

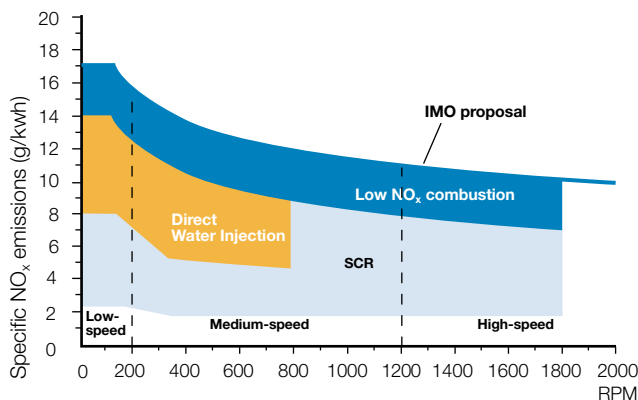
**SERVICE**

Proper adjustments and operation, use of high-quality fuels and lubrication oil, and careful maintenance using original spare parts - these are the best guarantees for having a properly working engine with optimized lifetime while maintaining the environmental properties it was designed to have. Good functionality and maintenance also minimize the

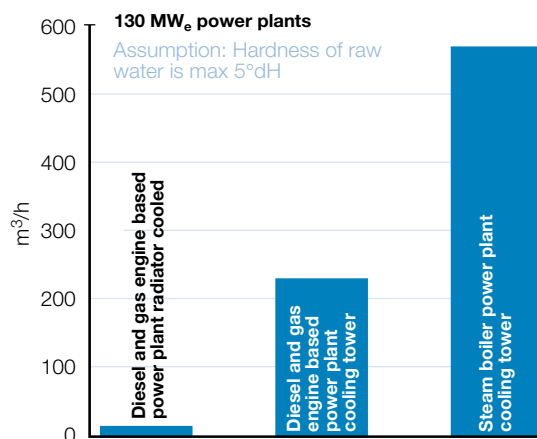
Exhaust gas emission control equipment delivered or currently on order from Wärtsilä (May 2001):

	Power Plants		Marine & Licensing	
	No of engines	Output (MW)	No of engines	Output (MW)
DWI	-	-	47	476
SCR	58	426	41	206
DeSO <sub>x</sub>	42	470	Not applicable	Not applicable

**NO<sub>x</sub> emission compliance of Wärtsilä products with IMO regulations**



**Raw water consumption in different Power Plants**





The Kudremukh power plant in India has 30 MW of installed power. The plant is equipped with a wet desulphurization system to keep  $SO_x$  emissions well below the stipulated limits.

risk of breakdowns which could result in larger environmental damage. We offer our customers a wide range of products and services to help them achieve these benefits.

As technology improves, older equipment can also be modified to meet stricter requirements for low fuel consumption and exhaust emissions.

These services and products are provided by Wärtsilä's Service Division.

The operation of our products is primarily supported by customized product documentation, which includes instructions for handling issues that could have an environmental impact. We also offer customized training at our training centres as well as on-site training as required to provide the skills needed to operate and maintain the products in optimal condition, considering also the environmental aspects of the engine and installation.

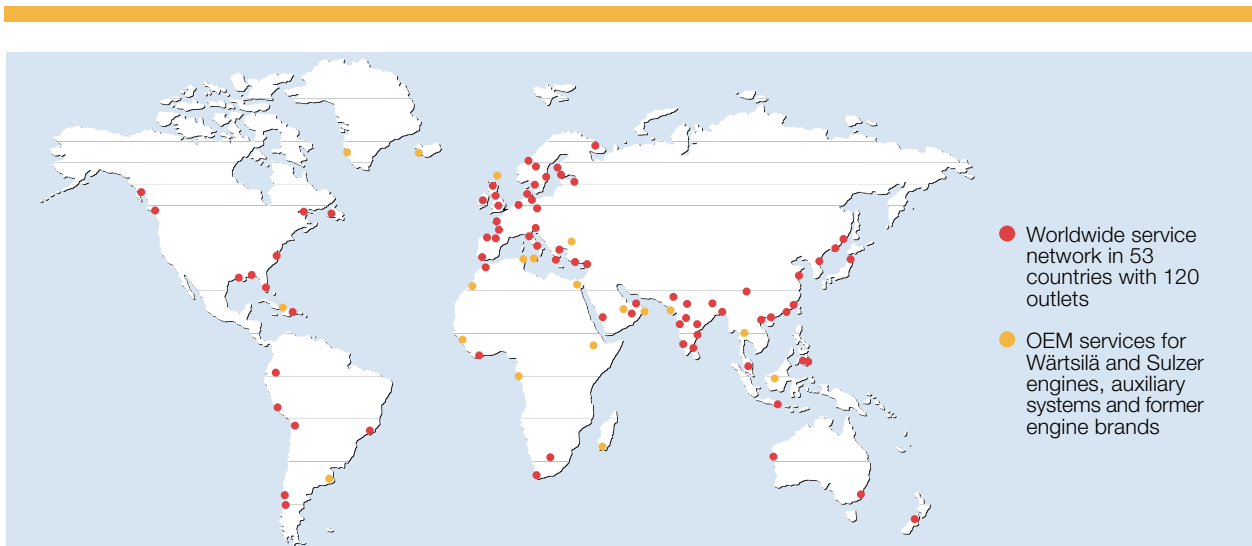
Our interactive multimedia system for centralized operation and maintenance of any installation comprises a data analyzing system for collection and analysis of operational engine data, a fault avoidance knowledge system supporting preventive maintenance and fault avoidance, an interactive electronic technical manual, a maintenance management system with preloaded installation-specific data and a

multimedia communication system giving ultimate service support for customers anywhere in the world.

The **Field Service** force is ready to assist 24 hrs a day, 365 days a year, to provide advice and skilled mechanics and engineers for any maintenance, modification or repair work needed to restore the engine to its proper conditions for best economical and environmental performance. The worldwide OEM- service station network ensures there is always a servicing unit providing skilled assistance close to the customer.

By signing a Wärtsilä service agreement our customers can make sure they get the best possible service for their Wärtsilä products as well as information about new technology. A full range of Service Agreement options provides basic lifecycle support for all equipment supplied by Wärtsilä:

- SparePart Supply Agreement ensuring parts and materials are there when needed
- Support Agreement providing assistance and support for daily operational routines
- Inspection Agreement with maintenance and advice on performance at set intervals
- Maintenance Support Agreement including support and training for preventive maintenance.
- Maintenance Agreement including manpower and parts for maintenance at intervals
- Management Support Agreement for tailor-made training of all personnel levels
- Performance Agreement ensuring availability, reliability and efficiency and
- Operation and Maintenance Agreement accepting total responsibility for O&M.



The **Technical Service** engine specialists provide expert assistance when unexpected problems occur. This force also monitors the operational engine base - evaluating and processing all available feedback to generate improvements to the engines and their maintenance systems. Maintenance costs have developed favourably over the years even though the engines have simultaneously become more complex, more efficient, lighter and cheaper, see a typical trend below.

The Technical Service experts develop services and tools and adapt new technologies which, through modernization conversions, improve environmental performance of various types of engine in operation. The services and products include the following major items which have an environmental impact:

- engine diagnostic audits
- vibration measurement services
- exhaust gas emission measurements
- noise emission measurements
- low NO<sub>x</sub> conversions
- direct water injection conversions
- compact SCR equipment
- conversion from HFO to gas diesel operation
- cleaning concepts and equipment with environmentally sound cleaning concentrates.

**Workshop Services** specialize in modernizations, raising the performance of old engines to their original level or, in some cases, to an even higher level. Besides restoring components or parts and complete engines, they also offer the exchange of reconditioned parts and engines as well as re-engining or re-

powering of complete installations. The use of recycled parts, components and complete engines makes economic and environmental sense. Upgrading of existing engines to meet stricter environmental requirements is by far the most rational way to meet new standards. Wärtsilä has established workshop service centres in Rotterdam, Genoa and Singapore, and this business is growing.

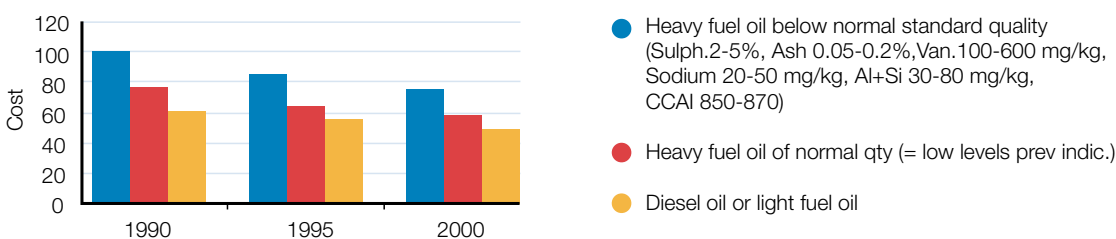
The **Parts Service** utilizes a modern logistics system and the commitment of the whole Wärtsilä sales and service network to guarantee fast delivery of original parts to any location in the world providing new and reconditioned parts.

**Highlights of R&D achievements from service point of view**

Before the 1990s specific consumption of lubrication oil tended to rise continuously as the power density and maximum firing pressure of engines increased. However, the invention of the “antipolishing ring” supported by advanced piston/ring technology in the early 1990s resulted in significant 50-80% drop in specific lube oil consumption as well as improvements in the cleanliness and lifetime of the lube oil.

Inventions such as the antipolishing ring, the pressure-lubricated nodular cast iron piston and advanced piston ring technology have resulted in substantially increased times between overhauls and lifetimes for all kinds of fuel qualities.

**Maintenance cost development**



Maintenance cost development, parts and work during 50 000 operating hours on different fuel qualities (18V32 engine >75% load, year 2000 price level).

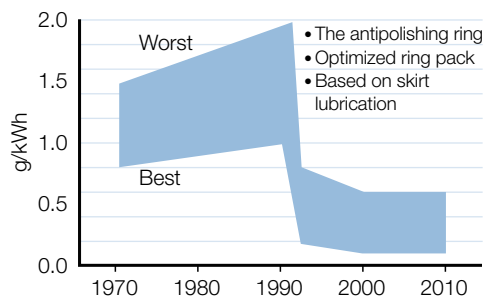


### Workshops & Training Centres

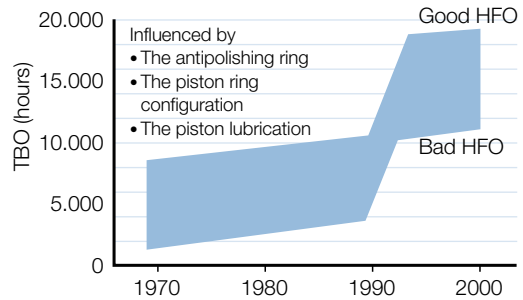


- Workshop
- Training centre
- Workshop and training centre

**Typical lubricating oil consumption of 4-stroke engines**



**Time between cylinder overhaul (TBO) of 4-stroke engines**



# Operational Performance

## Environmental aspects of Wärtsilä operations

Corporate sustainability performance encompasses the three linked elements of sustainability as they apply to Wärtsilä operations. This is an active responsibility, which stems from the company itself and its activities. It is built on environmental, economic and social performance. Wärtsilä incorporates all these elements in balance. The task is to realize sustainable development inside the company.

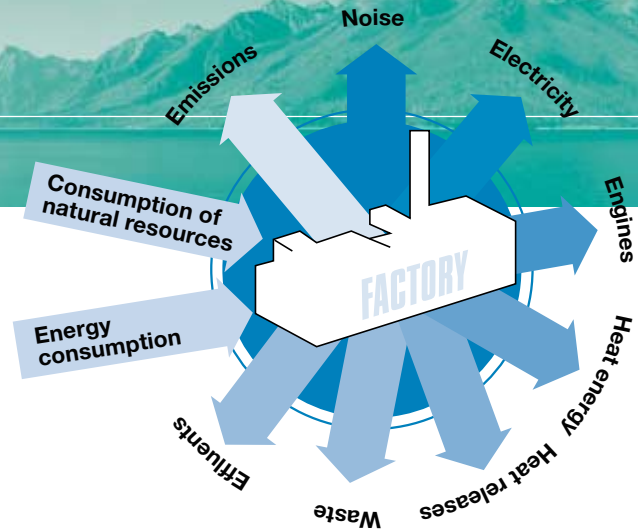
The environmental, economic and social performance of Wärtsilä companies includes all the premises and activities related to those premises taking into account manufacturing, sales, technology and services.



## ENVIRONMENTAL PERFORMANCE

Good environmental performance means sound management of natural resources and the environment. Protecting air, soil and water as well as combating climate change and using natural resources in a sustainable way are all important objectives.

The major part of our operational performance related to our premises is caused by our manufacturing activities. For that reason the following eco-balance presents our manufacturing activities. However, all the other activities are included in our performance data.



The environmental aspects related to manufacturing relate to the use of energy and natural resources and, consequently, to producing emissions, effluents and solid waste.

Natural resources are used as follows: metal parts and other components used as engine and propeller raw materials, heavy (HFO) and light fuel oil (LFO) as well as natural gas (LNG) used in engine test runs, electrical and heat energy used in real estate and production equipment maintenance. Additionally, noise emissions occur. The factory produces not only engines, but also electricity and heat that can be utilized from the energy consumed when testing engines.

## ENERGY

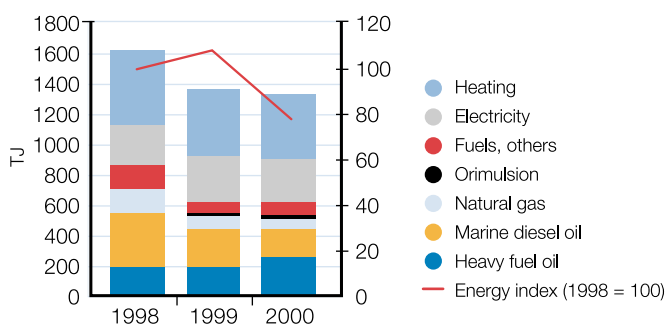
### Total energy consumption

The total energy consumption (in terajoules) presented below includes the electricity, heat and fuels used in our premises over the past years.

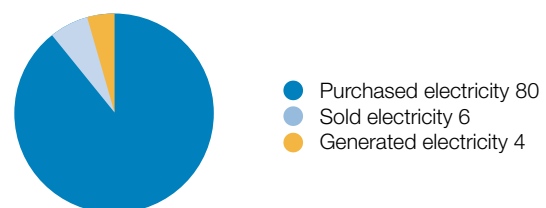
### Electricity

The energy generated from engine test runs is increasingly put to further use. Both the electrical and the heat energy generated in our test runs can be utilized. The aim is that Wärtsilä itself utilizes the electrical energy generated while also selling a portion of this electrical energy to a local power company. Due to the nature of a test run, there are dissimilarities in the production of electricity and the company's electricity demand; this allows the surplus energy to be sold to a local power company. The figure shows electricity consumption in Wärtsilä.

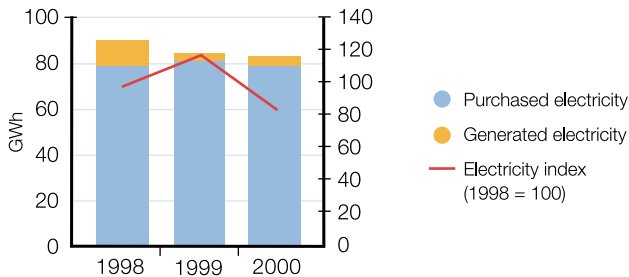
Annual energy consumption



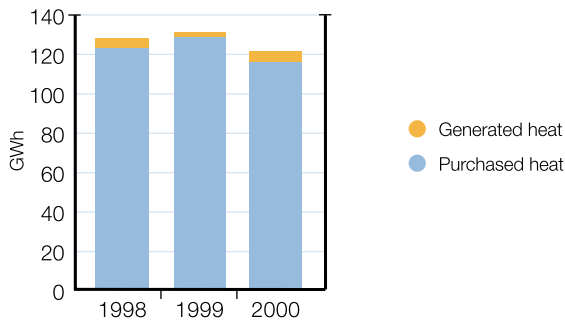
Electricity balance 2000 in GWh



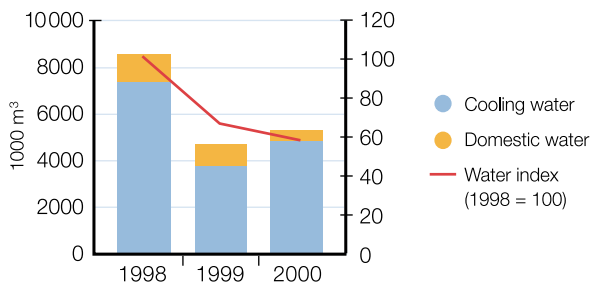
### Annual electricity consumption



### Annual heat consumption



### Annual water consumption



### Heat

The generated heat in a test run is used for heating in several factories. The figure shows heat consumption in Wärtsilä.

### Water

The water consumed by Wärtsilä can be divided into two categories: domestic use and cooling use. The domestic water is used mainly by washing machines and by employees.

Heat emissions from water system are caused by the use of engine cooling water. Some of the Wärtsilä companies use water from the local watercourse for their engine cooling needs. In such cases, the cooling water system is kept separate so that only heat is released into the natural water system.

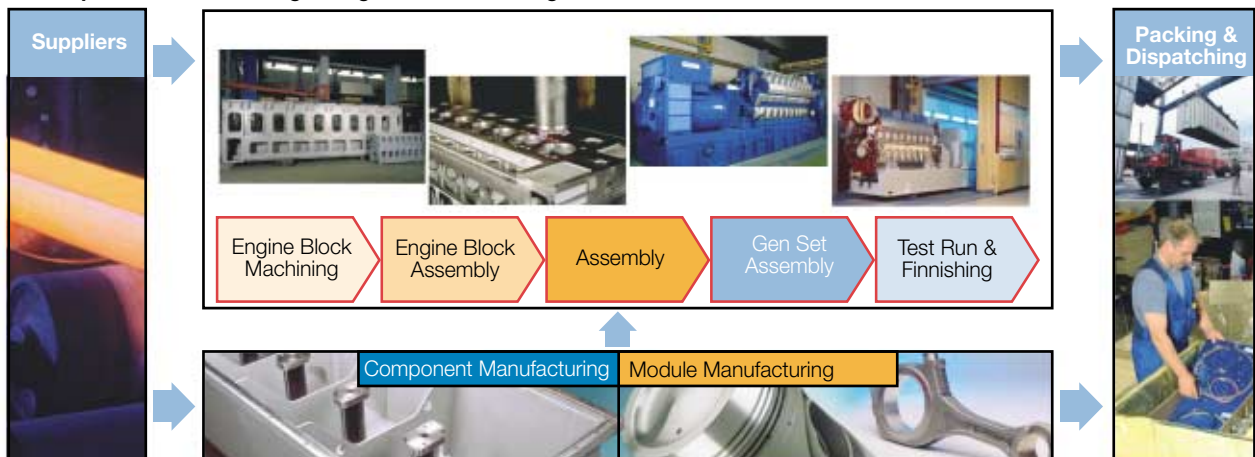
### Emissions to the air

Manufacturing noise is primarily caused by test running engines and by ventilation machinery on the factory floor. The noise is mostly low frequency, and is therefore not easy to detect by the human ear. Using technical solutions, issues related to noise protection were specifically addressed, and we have succeeded in lowering noise levels considerably.

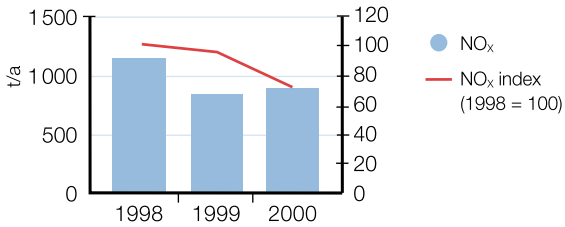
Air emissions are mainly caused by the test running and painting of completed engines. Test run emissions consist of nitrogen oxides, sulphur dioxide, carbon dioxides and particles, as well as small amounts of other emission components. The painting of engines generates VOC emissions (Volatile Organic Compounds).

The following figures show Wärtsilä's air emissions from engine test runs during recent years and emission trends related to production volumes. All the figures include the emissions from engine tests in Wärtsilä engine laboratories.

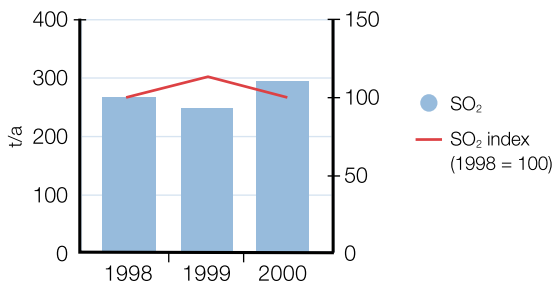
### Main processes in diesel/gas engine manufacturing



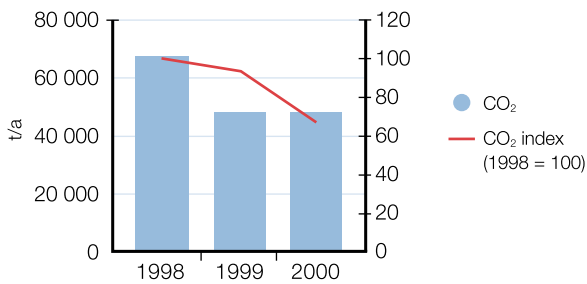
**Annual NO<sub>x</sub> emissions**



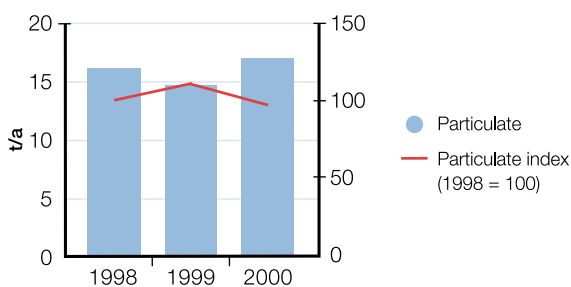
**Annual SO<sub>2</sub> emissions**



**Annual CO<sub>2</sub> emissions**



**Annual particulate emissions**



**Compliance**

The operations of Wärtsilä's product companies and laboratories require a valid environmental permit. Wärtsilä companies have required environmental permits, the terms of which generally are met. Non-compliance incidents are presented later in this report.

**Monitoring environmental impacts**

Within Wärtsilä, environmental impacts caused by operational activities are monitored as follows:

- Participation, for example, in the monitoring of air quality with other local stakeholders
- Measurement of air emissions
- Charting of noise levels
- Periodical effluent analysis

In addition Wärtsilä Finland Oy has participated in making the following surveys:

- Nitrogen fallout patterns
- Bio-indicator surveys
- NO<sub>x</sub> and SO<sub>2</sub> diffusion surveys

**Environmental disturbances and complaints**

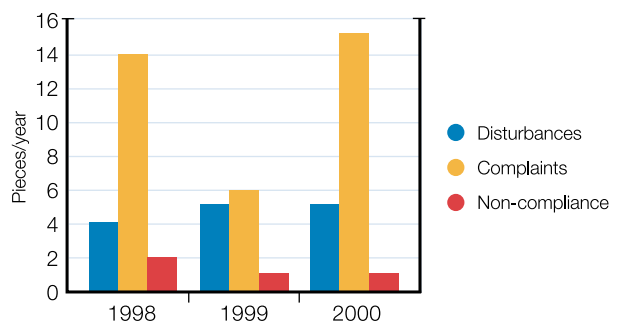
The number of disturbances, complaints and non-compliances are shown in the figure below. The reported disturbances cover the incidents where a company is usually obliged to report the incident to the authorities.

The following major environmental disturbances occurred at Wärtsilä locations during 2000:

- Fuel oil leakage and water leakage at the Turku Factory
- Leakage of hydrocarbons at the Trieste Factory
- Soot emissions at the Zwolle Factory
- Fire hazard at the Vaasa Factory.

All the above disturbances were inspected and appropriate corrective action was taken.

**Environmental disturbances and complaints**





In Wärtsilä France an internal study has been made to check the compliance with local regulations. Non-conformances were found and corrective action has been started. Most of the non-compliances will be rectified during 2001.

The major environmental concerns were in most cases voiced by our neighbours. The most common reason for a complaint is noise. All complaints are investigated and necessary corrective action is taken if needed.

The incident of non-compliance is related to Wärtsilä Italy's premises, where test running of one engine type is causing a higher noise level at night time than is stated in the permit conditions. To rectify this problem, Wärtsilä will install new silencers during June 2001.

#### Waste management

Engine manufacture causes various wastes. These are divided into two main categories: hazardous wastes and non-hazardous wastes. Hazardous wastes include used cutting fluids, various types of waste oil, paint and solvent waste, oily, solid wastes, etc. Hazardous wastes are delivered for appropriate treatment at a hazardous waste disposal facility.

All Wärtsilä companies sort their waste according to local municipal regulations. However, generally speaking the main sorting categories are waste to be incinerated, crude waste for landfills, clean cardboard, and waste paper. In addition, waste wood, scrap metal and metal chips are gathered separately. Only crude waste and in some cases waste wood are removed for landfill disposal, as needed. Other wastes are utilized either as raw materials or for energy. The aims of waste management are to:

- reduce the amount of the waste generated in Wärtsilä processes
- utilize the waste as a material
- utilize the waste as energy
- dispose of the waste in an environmentally sound way.

#### ECONOMIC PERFORMANCE

Economic performance involves meeting the expectations of shareholders and contributing towards the well-being of society. This requires that the company's operations are efficient, profitable and competitive.

Good economic performance establishes a base for the other aspects of sustainability. The economic performance indicator of Wärtsilä covers R&D expenses.

EUR Million	1998	1999	2000
R&D expenses <sup>1</sup>	73.7	73.5	79.6
% of net sales <sup>1</sup>	4.4	2.9	3.5
Environmental capital expenditure in operations	0.7	0.7	3.0
Operating expenses	2.2	2.2	2.4

<sup>1</sup>Reported R&D expenses cover only Wärtsilä Power Divisions.

#### Environmental costs

Environmental capital expenditure and operating costs are difficult to separate from normal operating costs in our operational environment. One of the essential goals of our R&D is the reduction of emissions. It is equally difficult to define capital expenditure as an exclusively environmental investment or as a machine or equipment investment in the production process.

Concerning Wärtsilä's operations, we have considered investments to be environmental investments, based on the principles of causation (water and air pollution control, waste management, energy recovery and noise control).

The following operating expenses, based on the principles of causation, are included in operating expenses: maintenance expenses in connection with emissions and noise control, as well as energy recovery, waste management and area maintenance service costs.

#### Environmental risk management

Environmental risks are monitored in the same way as other risks in the business. The basis for risk management is a systematic and continuous risk analysis and loss prevention work as well as the high quality of the products and the company's operations. The risk profile, the risk management policy and the insurance coverage needed are monitored from time to time by Wärtsilä's Board of Directors. Each Wärtsilä company is responsible for its own risk management. They are assisted by a Corporate Risk Manager.

#### Environmental liabilities

Environmental liabilities are primarily linked to real estate. The use of real estate for production or workshop purposes may result in environmental liabilities that normally materialize only when a business or real estate is sold or business operation is terminated, or if this real estate should have an exceptional impact on the environment or health.

Environmental liabilities are systematically scrutinized in connection with both sales and acquisitions of real estate. External specialists are involved when needed. If environmental liabilities are recognized in a sale situation, our policy is to take responsibility for the necessary measures to fulfil the conditions set for environmental clearance.

At present there are a few cases under review, as a result of which Wärtsilä might incur environmental liabilities. However, we anticipate that these cases do not result in material financial consequences for Wärtsilä. In sales situations part of the sales price contains a provision for environmental liabilities, where required. However, no general provision has been made for environmental liabilities of this kind.

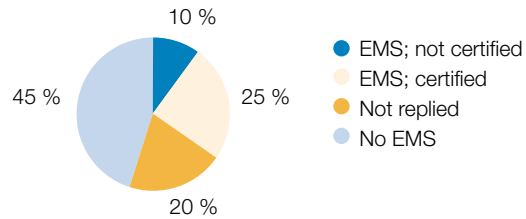
**SOCIAL PERFORMANCE**

Social performance entails implementing good working practices in all relations with stakeholders. It includes well-being and competence of the personnel, product safety and consumer protection, and fluid teamwork within the corporate network. It also includes cooperation with local communities, sponsorship and other activities for the public good. Wärtsilä's social performance indicators cover injuries and absence rate.

**Suppliers**

As defined in our environmental policy, our aim is to cover the whole supply chain and support our suppliers in developing efficient and sound procedures for environmental management. Nowadays 25% of our global suppliers (146 companies) are EMS certified. We will continuously encourage our suppliers to build environmental management systems.

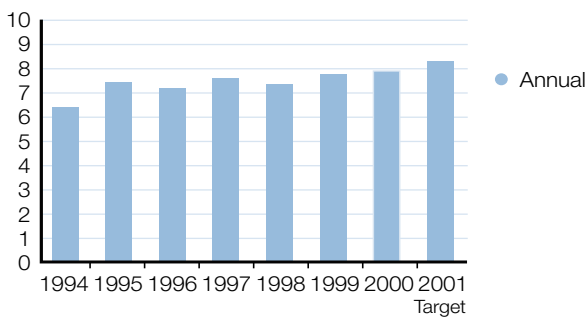
**Environmental management of Wärtsilä suppliers**



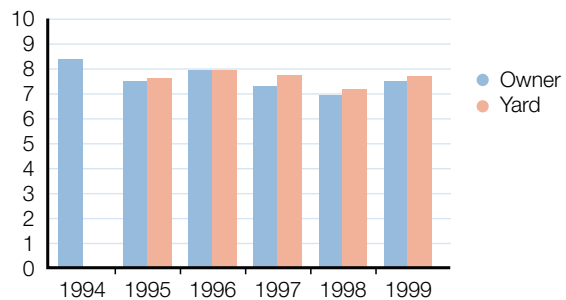
**Customer satisfaction index**

Customer satisfaction surveys are performed to obtain the necessary information on whether we have been able to satisfy our customers' needs or not. The trend in both Marine & Licensing and Power Plants customer satisfaction surveys shows that we have succeeded in improving our performance.

**Total customer satisfaction index 1995-2000 Power Plants**



**Total customer satisfaction index 1994-1999 Marine & Licensing**



The Marine & Licensing and Power Plants customer satisfaction index. (The customer satisfaction index is a mean value of the periodical customer questionnaire results on a scale from 1 to 10.)



### Training and personnel

The principle underlying employee training in Wärtsilä is continuous personal development. Wärtsilä provides its employees with good opportunities to participate in both internal and external training. The training courses mainly cover professional, communicational, environmental, quality and occupational health and safety issues. Language and IT training is also very significant for our employees.

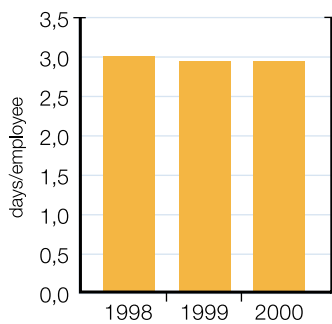
### Occupational health and safety

Wärtsilä is preparing corporate-level definitions for occupational health and safety indicators, which in the future will give better comparable information related to occupational health and safety issues.

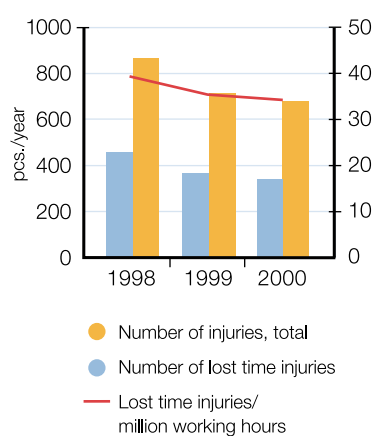
The number of injuries, shown in the figure below, includes all the reported injuries. The number of lost time injuries includes injuries which have caused at least one day of lost time.

The absence rate of Wärtsilä is presented in the figure below. The absence rates are based on reported absences.

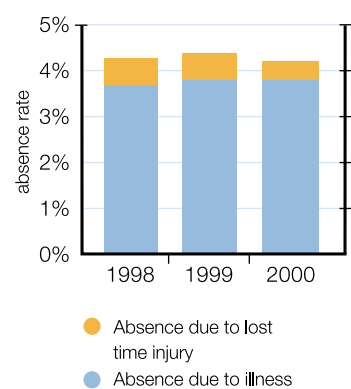
Training days



Injuries



Absence rate



## OPERATIONAL PERFORMANCE DATA

Performance Indicator <sup>1</sup>	1998	1999	2000
<b>ECONOMIC</b>			
R&D expenses [mill. euro]	73.7	73.5	79.6
Environmental capital expenditure in operations [mill. euro]	0.69	0.73	3.02
Environmental operating expenses [mill. euro]	2.21	2.23	2.45
<b>ENVIRONMENTAL</b>			
Total energy consumption [TJ]	1,605	1,385	1,340
Electricity consumption [MWh]	89,192	86,116	84,315
Heat consumption [MWh]	129,779	129,398	121,746
Marine diesel fuels [t]	8,395	5,454	4,691
Heavy fuels [t]	5,045	4,989	6,190
Natural gas [t]	3,065	1,976	1,366
Fuels, others [t]	3,814	2,038	2,163
Orimulsion [t]	0	392	797
Total water consumption [1000 m <sup>3</sup> ]	8,359	4,658	5,357
Domestic water consumption [1000 m <sup>3</sup> ]	832	790	609
Cooling water consumption [1000 m <sup>3</sup> ]	7,527	3,868	4,748
Nitrogen oxides emissions [t]	1,147	865	919
Carbon dioxide emissions [t]	66,514	48,389	48,492
Sulphur dioxide emissions [t]	269	248	286
Particulates [t]	16	14	17
<b>SOCIAL</b>			
Training days [days/employee]	3.0	2.9	2.9
Number of lost time injuries	439	373	348
Lost time injuries [number/mill. working hours]	39.4	35.3	34.6
Absence rate [% of total working hours]	4.19	4.37	4.24

<sup>1</sup> The operational performance data in this report has been combined from economic, environmental and social records of the Wärtsilä product companies. Whilst every effort has been made to ensure that the information is neither incomplete nor misleading, it cannot be considered as reliable as the financial data published in the Annual Report.

# Verification Statement

We have been engaged by the management of Wärtsilä Corporation to evaluate the scope and content of Wärtsilä Environmental Report 2000. The report is the responsibility of and has been approved by the management of Wärtsilä Corporation. The inherent limitations of completeness and the accuracy of the data are set out in the report.

The objective of our verification was to provide assurance in material respect on the reliability of economic, environmental and social data contained in the Wärtsilä Environmental Report 2000. We conducted our evaluation in accordance with International Standards on Auditing, where appropriate, and the Global Reporting Initiative's (GRI) Sustainability Reporting Guidelines. The scope of our work and the criteria used were agreed with the management of Wärtsilä Corporation.

Our work has consisted of the following procedures:

- discussions with the management responsible for compiling the report,
- an examination of relevant supporting information,
- an evaluation of accuracy, completeness and consistency of data in the report,
- review in more detail of the systems for gathering and reporting economic, environmental and social performance data at operating level at three sites, selected by us.

Based on our review we are adequately assured that:

- the statements made in the report are supported by underlying information,
- the data has been properly collated from information provided by the Wärtsilä Power Divisions,
- for the three sites visited, data has been properly extracted from their information systems.

The report has been prepared in the line with the Global Reporting Initiative's Sustainability Reporting Guidelines, although full compliance with all the recommendations of the guidelines necessitates a transition period. Wärtsilä has chosen to apply the guidelines incrementally. Wärtsilä's first corporate level environmental report is focused on environmental performance of Wärtsilä Power Divisions. Wärtsilä is developing sustainability data gathering and reporting system which will improve the completeness of information at the corporate level. It is our opinion that the data presented in the Wärtsilä Environmental Report 2000 gives, in all material respects, a fair and balanced view on the Wärtsilä Power Divisions' environmental performance.

Helsinki, 29 May 2001

KPMG WIDERI OY AB

Mauri Palvi  
Authorized Public Accountant

Mikael Niskala  
Manager, Sustainability Assurance

# Glossary

## Terms frequently used in Wärtsilä's publications

**Baseload** = Power plants running for more than 8,000 hours/year, i.e. generating power for continuous use.

**CO<sub>2</sub>** = Carbon dioxide. A component in an engine's exhaust gases always formed when fossil fuels are burned. The most significant greenhouse gas in the atmosphere, which prevents thermal radiation entering the atmosphere reflection back into space.

**Cogeneration** = The simultaneous generation of electricity and heat. Also called Combined Heat and Power = CHP. This method raises total efficiency to above 90% since the heat produced by power generation is recovered and used, for example, in industrial processes or to supply district heat.

**Combined cycle technology** = The use of two different power generation processes, e.g. fuel engines and steam turbines, in the same power plant. The second process utilizes the heat recovered from the first.

**Common Rail** = A method of fuel injection that eliminates the principle of one pump/cylinder. The Common Rail is constructed from a series of accumulators inter-connected by small-bore piping. The injection pressure is adjusted as desired and the injection timing (start and stop) controlled electronically. Wärtsilä has used Common Rail technology to develop the "smokeless engine", which reduces also NO<sub>x</sub> and CO<sub>2</sub> emissions.

**DCC (Diesel Combined Cycle)** = Technology utilizing both the shaft output and thermal output of a diesel engine. The thermal output is used to drive a steam turbine, for example.

**DeNO<sub>x</sub>** = Secondary emission reduction technology for emissions of nitrogen oxides. For example, a Selective Catalyst Reactor (SCR) is commonly used technology.

**DeSO<sub>x</sub>** = Secondary emission reduction technology for emissions of sulphur oxides. For example, alkali scrubbing and semidry DeSO<sub>x</sub> using quicklime or calcium carbonate scrubbers are commonly used technology.

**DWI (Direct Water Injection)** = A method in which water is injected into the engine cylinders prior to fuel injection, in order to reduce nitrogen oxide emissions. Direct water injection reduces the combustion temperature and therefore the formation of nitrogen oxides.

**Electrical efficiency** = Simple cycle: The ratio between the electrical energy produced by an alternator connected directly to the engine shaft and the input fuel energy. Combined cycle: the ratio between the total electrical energy produced by an alternator connected directly to the engine shaft plus the electricity produced by an additional steam cycle connected to an alternator and the input fuel energy.

**EnviroEngine™** = A smokeless diesel-electric propulsion package developed jointly by Wärtsilä and Carnival Corporation for marine vessels. Combines the use of Common Rail and DWI technologies. Since both methods are electronically controlled, the EnviroEngine offers an optimized combination of engine efficiency, smoke emissions and NO<sub>x</sub> emissions.

**Environmentally advanced product portfolio** = A portfolio, which provides environmentally advanced technologies for Wärtsilä's Marine, Power Plants and Service customers. For example common rail, direct water injection, hot combustion and engine upgrades are such technologies.

**Four-stroke engine** = An engine in which the pistons complete their working strokes every second engine revolution.

**FSN (Filter Smoke Number)** = A unit defining the amount of smoke. When measuring, exhaust gas is fed through a special filter element, the colour of which is then analyzed optically.

**Gas compression** = The raising of gas pressure and density for further processing. This makes it possible to use smaller storage tanks or pipes to transport a given quantity of gas.

**GTCC (Gas Turbine Combined Cycle)** = Technology utilizing the shaft and thermal outputs of a gas turbine.

**HFO** = Heavy fuel oil.

**High-speed engine (diesel/gas)** = An engine running at speeds over 1.200 rpm (revolutions per minute).

**Hot combustion** = A method that raises the temperature of the engine exhaust gases by reducing air intake and isolating the combustion chamber. This increases total efficiency and enhances the engine's suitability for combi technology.

**IMO** = The International Maritime Organization.

**IPP (Independent Power Producer)** = A private corporation producing electricity for sale on a national grid. Also an IPP power plant.

**Lean burn gas engine** = A gas-fired engine in which the gas-air mixture in the engine's cylinders contains substantially more air (roughly the double) than required for complete combustion of the gas. The overabundance of air achieves high output and efficiency combined with low nitrogen oxide emissions.

**Licensee** = A company authorized to manufacture under licence and that pays royalty fees on the products sold. Wärtsilä's low-speed Sulzer engines are mainly manufactured under licence.

**Load management** = Meeting varying demand for power, e.g. producing more energy when required.

**Low NO<sub>x</sub> technology** = A method for reducing nitrogen oxide emissions that also raises engine efficiency. Emission levels are reduced by regulating the combustion temperature in the cylinders and the duration of fuel injection.

**Low-speed engine** = An engine running at speeds below 300 rpm.

**Medium-speed engine (diesel/gas)** = An engine running at speeds of 300-1,200 rpm.

**Multi-fuel engine** = A Wärtsilä engine running on both gaseous and liquid fuels. (Engines denoted DF and GD are multi-fuel engines).

**Network company** = A sales and service company, which in some cases may have a service workshop or an assembly/test line.

**NO<sub>x</sub>** = Nitrogen oxides (NO and NO<sub>2</sub>). Products formed during the combustion of nitrogen in both the fuel and combustion air. Nitrogen oxides contribute to local eutrophication.

**Offshore** = Industrial activity at sea, e.g. drilling and pumping at an oil or gas well.

**OEM** = Original Equipment Manufacturer.

**OpExS (Operative Excellence System)** = A Wärtsilä program that seeks to enhance operational excellence throughout the production chain. The aim is to raise productivity through higher quality. Covers quality, environmental, occupational health and safety issues and self-assessment (EFQM).

**Orimulsion®** = A mixture of Orinoco bitumen and water produced in Venezuela.

**Product company** = A company, which has the functions of power divisions: Manufacturing, Marine, Power Plants, Service and Technology. Wärtsilä product companies are located in Finland, France, Italy, the Netherlands and Norway.

**Propulsion package** = The propulsion train (propeller, reduction gear, engine, etc.) used to drive a ship.

**SCR (Selective Catalytic Reduction)** = A method to reduce NO<sub>x</sub> emissions using a catalytic converter fitted after the engine. The catalytic converter requires the addition of an ammonia or a urea solution to the exhaust gases.

**Shaft efficiency** = The ratio between the mechanical power measured on the engine shaft and the chemical power of the input fuel.

**Simple cycle** = Power generation using only a thermal power plant.

**SO<sub>2</sub>** = Sulphur dioxide. Formed by combustion of sulphur when burning sulphur-containing fuels. Sulphur dioxide contributes to eutrophication.

**Traditional fuel injection** = Mechanically controlled fuel injection. Each engine cylinder has its own fuel injection pump and all the pumped fuel is fed directly into the cylinder.

**Turnkey power plant** = A power plant delivered to the customer ready for operation.

**Two-stroke engine** = An engine in which the pistons complete their working strokes every engine revolution.

## HEAD OFFICE:

**Wärtsilä Corporation**  
John Stenbergin ranta 2  
P.O. Box 196  
00531 Helsinki  
Finland  
tel. +358 10 709 0000  
fax +358 10 709 5700

## POWER DIVISIONS:

**Wärtsilä Corporation**  
Marine & Licensing Division  
John Stenbergin ranta 2  
P.O. Box 196  
00531 Helsinki  
Finland  
tel. +358 10 709 0000  
fax +358 10 709 5704

**Wärtsilä Corporation**  
Power Plants Division  
John Stenbergin ranta 2  
P.O. Box 196  
00531 Helsinki  
Finland  
tel. +358 10 709 0000  
fax +358 9 735 685

**Wärtsilä Corporation**  
Service Division  
Kauppapuistikko 15,  
5th Floor  
65100 Vaasa  
Finland  
tel. +358 10 709 0000  
fax +358 10 709 2422

**Wärtsilä Corporation**  
Technology Division  
John Stenbergin ranta 2  
P.O. Box 196  
00531 Helsinki  
Finland  
tel. +358 10 709 0000  
fax +358 9 735 685

**Wärtsilä Corporation**  
Manufacturing Division  
John Stenbergin ranta 2  
P.O. Box 196  
00531 Helsinki  
Finland  
tel. +358 10 709 0000  
fax +358 10 709 5702

**Wärtsilä Development & Financial Services Oy**  
John Stenbergin ranta 2,  
6th Floor  
P.O. Box 196  
00531 Helsinki  
Finland  
tel. +358 10 709 0000  
fax +358 10 709 5710

**Wärtsilä Development & Financial Services Oy**  
Pitkätatu 20, 2nd floor  
P.O.Box 244  
65101 Vaasa  
Finland  
tel. +358 10 709 0000  
fax +358 10 709 1757

## NETWORK:

**Argentina**  
**Wärtsilä Argentina S.A.**  
Viamonte 1336, 8th floor  
Office 52  
C1053 ACB Buenos Aires  
Argentina  
tel. +54 11 4374 1114  
fax +54 11 4374 2830

**Australia**  
**Wärtsilä Australia Pty Ltd.**  
48 Huntingwood Drive  
Huntingwood NSW 2148  
Australia  
tel. + 61 2 9672 8200  
fax + 61 2 9672 8585

**Wärtsilä Australia Pty Ltd.**  
109 Broadway  
Bassendean W.A. 6054  
Australia  
tel. +61 89 377 3337  
fax +61 89 377 3338

**Azerbaijan**  
**Wärtsilä Caspian Ltd.**  
32 Salyan Shoss Sabail  
District  
Baku 370001  
Azerbaijan Republic  
tel. +994 12 983 175 -79  
fax +994 12 983 172

**Bangladesh**  
**Wärtsilä Bangladesh Ltd.**  
Iqbal Centre (14th Floor)  
42 Kemal Ataturk Avenue  
Banani C/A  
Dhaka-1213  
Bangladesh  
tel. +880 2 881 8666 /  
18 240 302  
fax +880 2 988 3372

**Brazil**  
**Wärtsilä Brasil Ltda.**  
AV Rio Branco 116  
12 andar  
20040-001 Rio de Janeiro  
Brasil  
tel. +55 21 2505 6562  
fax +55 21 2505 6571 / 6572

**Canada**  
**Wärtsilä Canada Inc.**  
# 11-50 Akerley Boulevard,  
Burnside Industrial Park  
Dartmouth (Halifax)  
Nova Scotia B3B 1R8  
Canada  
tel. +1 902 468 1264  
fax +1 902 468 1265

**Chile**  
**Wärtsilä Chile Ltda.**  
Nueva de Lyon 96  
Oficina 305, Providencia.  
Santiago, Chile  
tel. +56 2 232 5031  
fax +56 2 232 8754

**Wärtsilä Chile Ltda.**  
Autopista 5980  
Talcahuano, Chile  
tel. +56 41 421 561  
fax +56 41 420 229

**Wärtsilä Chile Ltda.**  
Desiderio García  
Manzana C - Sitio 23 A -  
Barrio Industrial  
Iquique  
Chile  
tel. +56 57 415 226  
fax +56 57 414 731

**China**  
**Wärtsilä China Ltd.**  
Room 4201 Hopewell Centre  
183 Queen's Road East  
Wanchai  
Hong Kong, China  
tel. +852 2528 6605  
fax +852 2529 6672

**Wärtsilä Engine**  
**(Shanghai) Co. Ltd.**  
Unit A, 13 A/F Jiu Shi Fu Xin  
Mansion  
918 Huai Hai Road (M)  
200020 Shanghai  
PR China  
tel. +86 21 6415 5218  
fax +86 21 6415 5868

**Wärtsilä Beijing Repr. Office**  
Suite 5, 25th Floor,  
CITIC Building  
19 Jianguomenwai Dajie  
Beijing 100004  
P.R. China  
tel. +86 10 6593 1842  
fax +86 10 6593 1843

**Wärtsilä Dalian Repr. Office**  
Room 815-816 Furama Hotel  
No. 60 Ren Min Road  
Dalian 116001  
P.R. China  
tel. +86 411 282 2100  
fax +86 411 280 4455

**Wärtsilä Panyu Service Station**  
(Lian Hua Shan Power Station)  
Lian Hua Shan,  
Guaranteed Processing Zone  
Panyu, Guangdong 511440  
P.R. China  
tel. +86 20 8486 6241 / 6242  
fax +86 20 8486 6240

**Wärtsilä China Ltd.**  
Service Station, Shop No. 1,  
Ground Floor, Eastwood  
Center No. 5A, Kung Ngam  
Village Road  
Shau Kei Wan  
Hong Kong, China  
tel. +852 2560 4530  
fax +852 2560 4589

**Colombia**  
**Wärtsilä Colombia S.A.**  
Avenida 19# 118-30, of. 507  
Edif. Centro de Negocios  
Santa Fe de Bogota  
Colombia  
tel. +57 1 529 3760  
fax +57 1 529 3821

**Cyprus**  
**Wärtsilä Mediterranean Ltd.**  
Rebecca Court, 2nd Floor  
1 Promachon Eleftherias,  
Ayios Athansios  
4103 Limassol  
P.O. Box 53037,  
3133 Limassol, Cyprus  
tel. +357 5 322 620  
fax +357 5 314 467 / 468

**Denmark**  
**Wärtsilä Danmark A/S**  
Jens Munksvej 1  
P.O. Box 67  
DK-9850 Hirtshals  
Denmark  
tel. +45 99 569 956  
fax +45 98 944 016

**Wärtsilä Danmark A/S**  
Axel Torv 8, 1st floor  
DK-1609, Copenhagen V  
Denmark  
tel. +45 33 454 133  
fax +45 33 454 130

**Wärtsilä Danmark A/S**  
Haekken 3  
6700 Esbjerg  
Denmark  
tel. +45 75 135 000  
fax +45 75 133 575

**Dominican Republic**  
**Wärtsilä Dominica C. Ror A.**  
Aut Duarte Kn. 13  
Esq. ProL. 27 de Febrero  
Santo Domingo  
Dominican Republic  
tel. +1 809 481 0554

**Ecuador**  
**Wärtsilä Ecuador S.A.**  
Av. 12 de Octubre 2000  
y G. Salazar  
Edificio Plaza 2000, Piso 8  
Quito  
Ecuador  
tel. +593 2 235 130  
fax +593 2 235 110

**Finland**  
**Wärtsilä Finland Oy**  
Administration  
Tarhaajantie 2  
P.O. Box 252  
65101 Vaasa, Finland  
tel. +358 10 709 0000  
fax +358 6 356 7177

**Wärtsilä Finland Oy**  
Power Development  
Pitkätatu 20, 2nd floor  
P.O. Box 244  
65101 Vaasa, Finland  
tel. +358 10 709 0000  
fax +358 10 709 1757

**Wärtsilä Finland Oy**  
Marine & Licensing  
Tarhaajantie 2  
P.O. Box 252  
65101 Vaasa, Finland  
tel. +358 10 709 0000  
fax +358 6 356 7188



**Wärtsilä Finland Oy**  
Power Plants  
Tarhaajantie 2  
P.O. Box 252  
65101 Vaasa, Finland  
tel. +358 10 709 0000  
fax +358 6 356 9133 / 144

**Wärtsilä Finland Oy**  
Service  
Tarhaajantie 2  
P.O. Box 252  
65101 Vaasa, Finland  
tel. +358 10 709 0000  
fax +358 6 356 7355

**Wärtsilä Operations Ltd. Oy**  
Järvikatu 2-4  
P.O. Box 244  
65101 Vaasa, Finland  
tel. +358 10 709 0000  
fax +358 10 709 1757

**Wärtsilä Finland Oy**  
Production Plant  
Stålarinkatu 45  
P.O. Box 50  
20811 Turku, Finland  
tel. +358 10 709 0000  
fax +358 2 234 2419

**Wärtsilä Finland Oy**  
Production Plant  
Järvikatu 2 - 4  
P.O. Box 244  
65101 Vaasa, Finland  
tel. +358 10 709 0000  
fax +358 6 317 1906

**France**  
**Wärtsilä France S.A.S.**  
1 rue de la Fonderie  
BP 1210  
68054 Mulhouse  
France  
tel. +33 389 666 868  
fax +33 389 665 800

**Wärtsilä France S.A.S.**  
Usine de la Combe, BP 113  
17700 Surgères, France  
tel. +33 546 303 132  
fax +33 546 073 537

**Wärtsilä France S.A.**  
28 Boulevard Roger Salengro  
BP 1224  
78202 Mantes la Ville Cedex  
France  
tel. +33 1 34 788 800  
fax +33 1 34 788 803

**Wärtsilä France S.A.**  
Etablissement de la  
Méditerranée  
Les Baux RN 8  
13420 Gemenos  
France  
tel. +33 442 320 606  
fax +33 442 320 666

**Wärtsilä France S.A.**  
ZIA Rue de Lorival  
BP 411  
59474 Seclin Cedex, France  
tel. +33 320 625 800  
fax +33 320 327 147

**Germany**  
**Wärtsilä Deutschland GmbH**  
Schlenzigstrasse 6  
21107 Hamburg, Germany  
tel. +49 40 751 900  
fax +49 40 751 90190

**Greece**  
**Wärtsilä Greece**  
4 Loudovikou Sq.  
18531 Piraeus  
P.O. Box 86012  
GR 18503 Pireus, Greece  
tel. +30 1 413 5450  
fax +30 1 411 7902

**Guatemala**  
**Wärtsilä Guatemala S.A.**  
14 Avenia 7-122  
14 of. #1  
Guatemala City  
Guatemala  
tel. +502 366 9511  
fax +502 366 9552

**India**  
**Wärtsilä India Ltd.**  
76, Free Press House  
Nariman Point  
Mumbai 400 021, India  
tel. +91 22 281 5601  
fax +91 22 284 0427

**Wärtsilä India Ltd.**  
48, Neco Chambers Sector 11  
CBD Belapur  
400 614 Navi Mumbai, India  
tel. +91 22 757 5361 / 71  
fax +91 22 757 5176 / 7 / 8

**Wärtsilä India Ltd.**  
Plot no 10,11,12  
Sector no 1, Nerul  
400 706 Navi Mumbai, India  
tel. +91 22 770 7918 /19/20/21  
fax +91 22 770 8166

**Wärtsilä India Ltd.**  
Opp. Govt Rest House  
Mumbai - Pune Road  
Khopoli,  
Dist. Raigad 410 203, India  
tel. +91 219 264 389 / 90  
fax +91 219 263 314

**Wärtsilä India Ltd.**  
24 Siri Fort Road  
New Delhi 110 049, India  
tel. +91 11 625 1105 - 8  
fax +91 11 625 1109

**Wärtsilä India Ltd.**  
Centre Point, 4th floor,  
Juhu & SV Road Junction  
Santacruz West  
400054 Mumbai, India  
tel. +91 22 605 7506  
fax +91 22 605 7511

**Wärtsilä India Ltd.**  
East Anglia House  
3C Camac Street  
Kolkata 700 016, India  
tel. +91 33 245 8320  
fax +91 33 249 7535

**Wärtsilä India Ltd.**  
Lakshmi Chambers,  
30 Anna Salai, Saidapet  
Chennai 600 015, India  
tel. +91 44 230 1080 - 88  
fax +91 44 230 1089

**Wärtsilä India Ltd.**  
B Wing, 6th floor,  
Rama Bhavan Complex  
Kodialbail  
Mangalore 575 003, India  
tel. +91 824 441 722  
fax +91 824 443 556

**Wärtsilä India Ltd.**  
5th Floor,  
Paul Commercial Complex  
Ajni Square, Wardha Road  
Nagpur 440 015, India  
tel. +91 712 224 291  
fax +91 712 224 226

**Wärtsilä India Ltd.**  
Flat No. 302, Third Floor  
Oxford Plaza, 9-1-129/1  
Sarojiini Devi Road  
Secunderabad 500 003  
India  
tel. +91 40 771 5383 / 4 / 5  
fax +91 40 771 5377

**Wärtsilä India Ltd.**  
B-1/e-22, Mohan cooperative  
Industrial Estate, Mathura Road  
New Delhi 110 044, India  
tel. +91 11 694 1928  
fax +91 11 694 1929

**Indonesia**  
**P.T. Wärtsilä Indonesia**  
Cikarang Industrial Estate  
Jl. Jababeka XVI, Kav. W-28  
Cikarang 17530, Bekasi  
Jawa Barat, Indonesia  
tel. +62 21 893 7654  
fax +62 21 893 7661

**P.T. Stowindo Power**  
Cikarang Industrial Estate  
Jl. Jababeka XVI, Kav. W-28  
Cikarang 17530, Bekasi  
Jawa Barat, Indonesia  
tel. +62 21 893 7654  
fax +62 21 893 7661

**Ireland**  
**Wärtsilä Ireland Ltd.**  
Belgard Industrial Estate  
Dublin 24, Ireland  
tel. +353 1 459 5668  
fax +353 1 459 5672

**Wärtsilä Ireland Ltd.**  
St Catherines Road  
Killybegs, Co. Donegal  
Ireland  
tel. +353 73 32 177  
fax +353 73 32 180

**Italy**  
**Wärtsilä Italia S.p.A.**  
Bagnoli della Rosandra 334  
San Dorligo della Valle  
34018 Trieste, Italy  
tel. +39 040 319 5000  
fax +39 040 827 371

**Wärtsilä Italia S.p.A.**  
Unità di Milano  
Via Nazario Sauro, 5  
20068 Canzo di Peschiera  
Borromea (Milano), Italy  
tel. +39 02 553 9061  
fax +39 02 553 90639

**Wärtsilä Italia S.p.A.**  
Via al Molo Giano  
16128 Genova, Italy  
tel. +39 010 599 5853  
fax +39 010 247 2341

**Wärtsilä Italia S.p.A.**  
**Base di Napoli**  
Calata Porta di Massa  
80133 Napoli, Italy  
tel. +39 081 552 7530  
fax +39 081 552 7680

**Wärtsilä Navim Diesel S.r.l.**  
Via Carrara 24/26  
16147 Genova, Italy  
tel. +39 010 373 0779  
fax +39 010 373 0757

**Ivory Coast**  
**Wärtsilä ACO**  
17 rue Pierre et Marie Curie  
BP 4432, Zone 4 A  
Abidjan 01, Ivory Coast  
tel. +225 351 876  
fax +225 351 506

**Japan**  
**Wärtsilä Japan Co. Ltd.**  
Kobe Yusen Bldg  
1-1-1, Kaigan-dori, Chuo-ku  
Kobe 650-0024, Japan  
tel. +81 78 392 5333  
fax +81 78 392 8688

**Wärtsilä Japan Co. Ltd.**  
Binary Kita-Aoyama Bldg, 8F  
3-6-19, Kita-Aoyama,  
Minato-ku,  
Tokyo 107-0061, Japan  
tel. +81 3 3486 4531  
fax +81 3 3486 4153

**Kenya**  
**Wärtsilä East Africa Ltd.**  
House of Vanguard, Fuji Plaza  
"5th floor" Chiromo Rd,  
Westlands  
PO Box 66782, Nairobi, Kenya  
tel. +254 244 6985 / 6  
fax +254 244 6719

**Korea**  
**Wärtsilä Korea Ltd.**  
Noksan Bldg. 6th Fl.  
50-11, Yonggang-dong,  
Mapo-Gu  
Seoul 121-070, Korea  
tel. +82 2 3272 8032 - 5  
fax +82 2 3272 8036

**Wärtsilä Korea Ltd.**  
Pusan Marine Center Bldg.,  
10th floor  
79-1, Chungangdong 4-Ga,  
Chung-Gu  
Pusan 600-014, Korea  
tel. +82 51 783 9015 - 6  
fax +82 51 783 9017

**Wärtsilä Korea Ltd.**  
Service / Pusan Marine Centre,  
10th floor  
79-1, Chungangdong 4-Ga,  
Chung-Gu  
Pusan 600-604, Korea  
tel. +82 51 469 5421  
fax +82 51 469 5422

**Wärtsilä Korea Ltd.**  
License manufacturing / Pusan  
Marine Centre  
79-1, Chungangdong 4-Ga,  
Chung-Gu  
Pusan 600-604, Korea  
tel. +82 51 466 5916  
fax +82 51 466 5919

**Wärtsilä Korea Ltd.**  
Marine / Pusan Marine Centre  
10th floor  
79-1, Chungangdong 4-Ga,  
Chung-Gu  
Pusan 600-604, Korea  
tel. +82 51 465 2191  
fax +82 51 465 5222

**Malaysia**  
**Wärtsilä Malaysia SDH BHD**  
No 1, Jalan SS3/51  
Petaling Jaya  
47300 Selangor Darul Ehsan  
Malaysia  
tel. +60 3 7877 2487  
fax +60 3 7876 7604

**Mexico**  
**Wärtsilä de Mexico SA**  
Guillermo Gonzalez Camarena  
#1100, Piso 5o  
Col. Centro Ciudad de Santa Fe  
Mexico, D.F.01210  
Mexico  
tel. +5 25 257 1901  
fax +5 25 570 9201

**The Netherlands**  
**Wärtsilä Nederland B.V.**  
Power Plants  
Hanzelaan 95  
P.O. Box 10608  
8000 GB Zwolle  
The Netherlands  
tel. +31 38 425 3253  
fax +31 38 425 3971

**Wärtsilä Nederland B.V.**  
Marine & Licensing  
Hanzelaan 95  
P.O. Box 10608  
8000 GB Zwolle  
The Netherlands  
tel. +31 38 425 3253  
fax +31 38 425 3352

**Wärtsilä Nederland B.V.**  
Service  
Hanzelaan 95  
P.O. Box 10608  
8000 GB Zwolle  
The Netherlands  
tel. +31 38 425 3253  
fax +31 38 425 3538

**Wärtsilä Compression  
Systems**  
Hanzelaan 95  
8017 JE Zwolle  
The Netherlands  
tel. +31 38 425 3253  
fax +31 38 425 3973

**Wärtsilä Nederland B.V.**  
Het Nieuwe Werk 102  
P.O. Box 116  
1780 AC Den Helder  
The Netherlands  
tel. +31 223 635 988  
fax +31 223 633 890

**Wärtsilä Nederland B.V.**  
Trawlerkade 46  
1976 CB IJmuiden  
The Netherlands  
tel. +31 255 511 678  
fax +31 255 536 724

**Wärtsilä Nederland B.V.**  
Havenstraat 18  
3115 HD Schiedam  
The Netherlands  
tel. +31 10 427 7100  
fax +31 10 426 4571

**Wärtsilä Nederland B.V.**  
Deltahaven 7  
3251 LC Stellendam  
The Netherlands  
tel. +31 187 491 956  
fax +31 187 493 428

**Wärtsilä Nederland B.V.**  
Industrierondweg 6D  
8321 EA Urk  
The Netherlands  
tel. +31 527 682 053  
fax +31 527 685 902

**Wärtsilä Nederland B.V.**  
Damsterkade 6  
9934 CT Delfzijl  
The Netherlands  
tel. +31 596 611 965  
fax +31 596 611 965

**New Zealand**  
**Wärtsilä Australia Pty Ltd.**  
Port of Wellington Authority  
Complex  
Shed 29, Hinemoa Street  
P.O. Box 1375 Wellington  
Port Wellington  
New Zealand  
tel. +64 4 473 0830  
fax +64 4 473 0831

**Norway**  
**Wärtsilä Norway AS**  
5420 Rubbestadsneset  
Norway  
tel. +47 53 422 500  
fax +47 53 422 501

**Wärtsilä Norway AS**  
Hestehagen 5  
Holter Industriområde  
1440 Drøbak, Norway  
tel. +47 64 937 650  
fax +47 64 937 660

**Pakistan**  
**Wärtsilä Pakistan (Pvt) Ltd.**  
16-Kilometer, Raiwind Road  
P.O. Box 10104  
Lahore, Pakistan  
tel. +92 42 541 8846  
fax +92 42 541 3481

**Wärtsilä Pakistan (Pvt) Ltd.**  
2nd floor, POF Liaison offices  
252 Sarwar Shadeed Road,  
Saddar  
Karachi, Pakistan  
tel. +92 21 568 1284 / 2475  
fax +92 21 568 2797

**Peru**  
**Wärtsilä Perú SA**  
J. Arias Aragüez 210  
San Antonio  
Miraflores, Lima 18, Peru  
tel. +51 1 241 7030  
fax +51 1 444 6867

**Philippines**  
**Wärtsilä Philippines Inc.**  
No 6 Diode Street, Light  
Industry and Science Pk.  
Bo. Diezmo  
Cabuyao, Laguna  
Philippines  
tel. +63 49 543 0382  
fax +63 49 543 0381

**Poland**  
**Wärtsilä Polska, Sp.zo.o.**  
Al. Wilanowska 372  
02-665 Warszawa, Poland  
tel. +48 22 843 8751  
fax +48 22 843 8752

**Wärtsilä Polska, Sp.zo.o.**  
Ul. Grunwaldzka 139  
80-264 Gdansk  
Poland  
tel. +48 58 345 2344  
fax +48 58 341 6744

**Portugal**  
**Wärtsilä Portugal, Lda.**  
Zona Industrial Da Maia I  
Sector X Lote 362, No.43,  
Apartado 415,  
P 4470 Maia Codex  
Portugal  
tel. +351 22 943 9720  
fax +351 22 943 9729

**Puerto Rico**  
**Wärtsilä Caribbean, Inc.**  
Calle A Lote 5,  
Carr 887 KM 0.6,  
Industrial Park Julio M. Matos,  
P.O.Box 7039  
Carolina 00986  
Puerto Rico  
tel. +1 787 792 8080  
fax +1 787 792 2600

**Russia**  
**Wärtsilä Corporation**  
**Repr. office**  
Shvedsky pereulok 2  
191186 St.Petersburg  
Russia  
tel. +7 812 118 6331  
fax +7 812 118 6330 / 63 29

**Wärtsilä Corporation**  
Repr. office  
Pokrovsky Bulvar, 4/17, building  
4B  
101000 Moscow, Russia  
tel. +7 095 937 7589  
fax +7 095 937 7590

**Wärtsilä NSD Service Ltd.**  
Miussskaya Square 7,  
office 119  
125811 Moscow, Russia  
tel. +7 095 251 7819  
fax +7 095 251 4364

**Wärtsilä Vladivostok Ltd.**  
57, Krygina St., office 40-42  
690090 Vladivostok, Russia  
tel. +7 4232 510 710  
fax +7 4232 510 711

**Saudi Arabia**  
**Wärtsilä Saudi Arabia Ltd.**  
P.O. Box 2132  
Industrial City, Phase 4  
Jeddah 21451  
Saudi Arabia  
tel. +966 2 637 6470  
fax +966 2 637 6482

**Senegal**  
**Wärtsilä West Africa**  
Km 4,5 Bd du Centenaire de la  
Commune de Dakar  
B.P. 21861  
Dakar-Ponty, Senegal  
tel. +221 8 321 026  
fax +221 8 321 025

**Singapore**  
**Wärtsilä Singapore Pte Ltd**  
14 Benoi Crescent  
Singapore 629977, Singapore  
tel. +65 265 9122  
fax +65 265 0910

**Wärtsilä Development &  
Financial Services (Asia) Ltd.**  
14 Benoi Crescent  
Singapore 629977, Singapore  
tel. +65 265 9122  
fax +65 266 0533

**South Africa**  
**Wärtsilä South Africa Pty Ltd.**  
36 Neptune Street  
Paarden Eiland  
Cape Town, South Africa  
tel. +27 21 511 1230  
fax +27 21 511 1412

**Wärtsilä South Africa Pty. Ltd.**  
143 Maydon Rd  
Durban 4000  
South Africa  
tel. +27 31 206 2214  
fax +27 31 205 8971

**Spain**  
**Wärtsilä Ibérica S.A.**  
Poligono Industrial Landabaso,  
S/n Apartado 137  
48370 Bermeo / Vizcaya, Spain  
tel. +34 94 617 0100  
fax +34 94 617 0112

**Wärtsilä Ibérica S.A.**  
Misiones 8 (El Cebadal)  
P.O. Box 2831  
35008 Las Palmas de Gran  
Canaria, Spain  
tel. +34 928 467 859  
fax +34 928 465 931

**Sweden**  
**Wärtsilä Sweden AB**  
Åkerssjövägen  
P.O. Box 920  
46129 Trollhättan, Sweden  
tel. +46 520 422 600  
fax +46 520 422 727

**Wärtsilä Sweden AB**  
Polstjärnegatan 10  
P.O. Box 8006  
40277 Göteborg, Sweden  
tel. +46 31 656 100  
fax +46 31 656 107

**Switzerland**  
**Wärtsilä Switzerland Ltd.**  
Zürcherstrasse 12  
P.O. Box 414  
8401 Winterthur, Switzerland  
tel. +41 52 262 4922  
fax +41 52 212 4917

**Taiwan**  
**Wärtsilä Taiwan Ltd.**  
13F-4,  
No. 186 Jiang Yi Road  
Chung Ho City  
Taipei Hsieng, Taiwan R.O.C.  
tel. +886 2 82271066  
fax +886 2 82271067

**Turkey**  
**Wärtsilä Enpa Dis Tic. A.S.**  
Süleyman Seba Cad No:92,  
Besiktas Plaza  
A Blok Zemin Kat  
Besiktas, Istanbul, Turkey  
tel. +90 212 258 5516 /  
327 1530  
fax +90 212 258 9998 /  
327 1535

**United Arab Emirates**  
**Wärtsilä Gulf FZE**  
P.O. Box 61494  
Jebel Ali, Dubai  
United Arab Emirates  
tel. +971 4883 8979  
fax +971 4883 8704

**United Kingdom**  
**Wärtsilä UK Ltd.**  
Tubs Hill House,  
Sevenoaks  
Kent TN13 1BL, U.K.  
tel. +44 1732 744 400  
fax +44 1732 744 420

**Wärtsilä UK Ltd.**  
Girdleness Trading Estate  
Wellington Road  
Aberdeen AB11 8DG, Scotland,  
U.K.  
tel. +44 1224 871 166  
fax +44 1224 871 188

**Wärtsilä UK Ltd.**  
30, Brunel Way  
Segensworth  
FAREHAM  
Hampshire PO15 5SD UK  
tel. +44 1489 550 050  
fax +44 1489 550 055

**United States**  
**Wärtsilä North America, Inc.**  
201 Defense Highway,  
Suite 100 Annapolis,  
Maryland 21401  
U.S.A.  
tel. +1 410 573 2100  
fax +1 410 573 2200

**Wärtsilä Development &  
Financial Services, Inc.**  
201 Defense Highway,  
Suite 100, Annapolis, Maryland  
21401,  
U.S.A.  
tel. +1 410 573 9750  
fax +1 410 573 4928

**Wärtsilä North America, Inc.**  
1 Blue Hill Plaza 3rd floor  
Pearl River  
New York 10965, U.S.A.  
tel. +1 914 623 1212  
fax +1 914 623 3385

**Wärtsilä North America, Inc.**  
Summit Tower, suite 2920  
Eleven Greenway Plaza  
Houston, Texas 77046,  
U.S.A.  
tel. +1 713 840 0020  
fax +1 713 840 0009

**Wärtsilä North America, Inc.**  
Harbor Cove Plaza, suite 210,  
29000 South Western Ave.  
Rancho Palos Verdes  
CA 90275, U.S.A.  
tel. +1 310 831 7424  
fax +1 310 831 7426

**Wärtsilä North America, Inc.**  
2900 S.W. 42nd Street  
Ft. Lauderdale / Hollywood,  
FL 33312, U.S.A.  
tel. +1 954 327 4700  
fax +1 954 327 4876

**Wärtsilä North America, Inc**  
1313 MacArthur Blvd  
Harvey, Louisiana 70058, U.S.A.  
tel. +1 504 341 7201  
fax +1 504 341 0426

**Wärtsilä North America, Inc.**  
1410 Old Highway 69 South Mt,  
Vernon, In 47620, U.S.A.  
tel. +1 812 838 9280  
fax +1 812 838 9288

**Wärtsilä North America, Inc.**  
1100 NW 51st Street  
Seattle, Washington 98107  
U.S.A.  
tel. +1 206 784 9100  
fax +1 206 781 5586

**Pacific Power Resources Inc.**  
283 East Marine Drive, suite 3  
Hagatna  
Guam 96910, U.S.A.  
tel. +1 671 472 4521  
fax +1 671 472 4505

**Venezuela**  
**Wärtsilä Venezuela C.A.**  
San Martin, Zona Postal 1020  
Apartado Postal N20438  
Caracas, Venezuela  
tel. +58 2 351 4864  
fax +58 2 351 4864

**Vietnam**  
**Wärtsilä Vietnam Co. Ltd.**  
Central Plaza Office Building,  
7th Floor  
17 Le Duan Street, Dist. 1  
Ho Chi Minh City, Vietnam  
tel. +84 8 824 4534 / 5  
fax +84 8 829 4891

**IMATRA STEEL**  
**HEAD OFFICE:**  
**Imatra Steel Oy Ab**  
Head Office  
John Stenbergin ranta 2  
P.O.Box 790  
FIN-00101 Helsinki, Finland  
Telephone +358 9 7095300  
Fax +358 9 7731080

**NETWORK:**  
**Finland**  
**Imatra Steel Oy Ab, Imatra**  
Terästehtaantie 1  
FIN-55100 Imatra, Finland  
Telephone +358 5 68021  
Fax +358 5 6802211

**Imatra Steel Oy Ab**  
Sales Finland and Steel Service  
Centre  
Teollisuuskujja 1  
FIN-14200 Turenki, Finland  
Telephone +358 3 5702600  
Fax +358 3 5702602

**Imatra Steel Oy Ab, Billnäs**  
FIN-10330 Billnäs  
Finland  
Telephone +358 19 277731  
Fax +358 19 277650

**France**  
**Imatra Steel. S.a.r.l.**  
696, rue Yves Kermen  
F-92658 Boulogne Billancourt,  
Cedex, France  
Telephone +33 1 46941636  
Fax +33 1 46941637

**Germany**  
**Imatra Stahl GmbH**  
Kurfürstenstrasse 30  
P.O.Box 103064  
D-40021 Düsseldorf  
Germany  
Telephone +49 211 936040  
Fax +49 211 9360430

**Norway**  
**Imatra Steel, Norway**  
Box 30  
N-1801 Askim  
Norway  
Telephone +47 69 881667  
Fax +47 69 886367

**Sweden**  
**Imatra Kilsta AB**  
P.O.Box 428  
S-691 27 Karlskoga  
Sweden  
Telephone +46 586 63200  
Fax +46 586 63202

**Imatra Tooling AB**  
P.O.Box 427  
S-691 27 Karlskoga  
Sweden  
Telephone +46 586 63370  
Fax +46 586 63380

**Imatra Steel Oy Ab**  
Market Area Scandinavia  
P.O.Box 429  
S-691 27 Karlskoga  
Telephone +46 586 63200  
Fax +46 586 63369

**United Kingdom**  
**Imatra Steel Ltd**  
The Saturn Centre  
Spring Road Ettingshall  
Wolverhampton WV4 6JX  
Great Britain  
Telephone +44 1902 354144  
Fax +44 1902 354145

WÄRTSILÄ® and SULZER® are  
registered trademarks.

## CONTACT US

Dear reader, if you have any  
comments on our environ-  
mental report, please visit  
our website and give your  
feedback.

[www.wartsila.com](http://www.wartsila.com)



Wärtsilä Corporation  
John Stenbergin ranta 2  
P.O. Box 196  
FIN-00531 Helsinki  
Finland  
Tel. +358 10 709 0000  
Fax +358 10 709 5700  
[www.wartsila.com](http://www.wartsila.com)

Second edition 2001